ARCHAEOLOGICAL WATCHING BRIEF ON LAND AT PILLING'S LOCK, QUORN, LIECESTERSHIRE (QPL03)

Work Undertaken For
London Rock Supplies Ltd

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Report Compiled by
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Planning Application No: 02/01852/2 and 02/0257/2
National Grid Reference: SK 562 184
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APS Report No. **111/08**

ARCHAEOLOGICAL PROJECT SERVICES

Quality Control

Land At Pilling's Lock, Quorn,
Liecestershire
QPL03

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1. SUMMARY

An intensive archaeological watching brief was undertaken on land at Pilling's Lock, Quorn, Leicestershire as the site contained a number of areas of archaeological activity dating to the Iron Age and earlier.

During the watching brief, an ancient course of the Soar river was revealed as a palaeochannel and recorded in a number of sections. An environmental sample taken from one of these sections permitted the analysis of the pollen sequence providing insight into the palaeoenvironmental and palaeoclimatic history of the channel, beginning in the Mesolithic and ending in the Bronze Age. The sequence showed that the flow of the river had been subject to periodic change and that the ecology of the area was transformed from scrubby woodland (subject to occasional clearance by fire) to more open pasture with land management and burning taking place within the wider area.

During the watching brief the enclosure ditch recorded in excavation area A was mapped to the limits of the site.

A small quantity of post-medieval finds was recovered from the topsoil.

2. INTRODUCTION

2.1 Definition of a Watching Brief

An archaeological watching brief is defined as *"a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed."* (IFA 1999).

2.2 Planning Background

Archaeological Project Services was commissioned by London Rock Supplies Ltd to undertake an intensive archaeological watching brief during groundworks associated with gravel extraction and the construction of a marina on land at Pilling's Lock, Quorn, Leicestershire.

A Desk Based Archaeological Assessment (Tann 2001) commissioned by the applicant highlighted the archaeological potential of the site. As a result Leicestershire County Council advised that an archaeological evaluation of the site should be undertaken in advance of the determination of planning applications 02/01852/2 and 02/0257/2. The evaluation identified significant archaeological remains of Iron Age date, and a palaeochannel extending across the eastern part of the site. The Senior Planning Archaeologist of Leicestershire County Council Heritage Services issued a brief outlining a requirement for the excavation of two 20m x 20m areas of the site, which was undertaken by APS in 2003 (Mellor 2005) and targeted the southwest end of the application area where an Iron Age ring gully and associated features were identified. An intensive archaeological watching brief during topsoil stripping on the remaining areas of the site was also required.

The watching brief was carried out between the 15th June 2004 and 7th June 2005 in accordance with a specification prepared by Archaeological Project Services (Appendix 1) and approved by the Senior Planning Archaeologist of Leicestershire County Council Heritage Services.

2.3 Topography and Geology

Pilling's Lock is located 2km north of Quorn and 2km east of Loughborough in

Leicestershire (Figure 1).

The site forms an approximately 8.7 hectare area located west of the Grand Union Canal, centred at National Grid Reference SK 562 184. The site lies within 500m of the Soar River at around 40m OD, on fairly flat and level land (Figure 2).

Local soils are fine and coarse loamy soils of the Wigton Moor Association developed on glaciofluvial and river terrace deposits associated with river valleys, which are affected by fluctuating groundwater (Hodge *et al* 1984, 355). Within the development area, the soils overly a solid geology of Keuper Marl.

A borehole survey of the site in 2001 indicated an early course of the River Soar running through the proposed development site and this was confirmed during the archaeological evaluation of the site, although this remains undated.

2.4 Archaeological Setting

The earliest remains from the area comprise fragments of woolly rhinoceros, mammoth and a possible hand axe of Palaeolithic date, discovered during extraction at the Quorn Gravel Pit, Barrow upon Soar (now Proctor's Pleasure Park), *c.*3km southeast of the development site. The whereabouts of these artefacts cannot be traced and they are known only from written records. Such finds, retrieved from the gravel in the area, are assumed to have been removed from their original sites and redeposited.

Scatters of Mesolithic worked flints have been recorded *c.*1.7km to the southwest of Pillings's Lock, and also in Buddon Wood, *c.*3km to the south. Neolithic scrapers and Late Bronze Age finds have also been made at Buddon Wood, located on the edge of higher ground and a prime site for use in these periods. Circular ditched features have been identified in Quorn, one of which lies immediately north of the sewage works, *c.*150m southwest of the site (SMR No. LE825), and a second is located on Catsick Hill (SMR No. LE462), east of the River Soar (Figure 2). These have been provisionally identified as the leveled sites of Bronze Age burial mounds (Tann 2001). Cropmarks have been recorded of a rectangular enclosure (SMR No. LE797) within the extraction site, which, it has been suggested, is prehistoric. However re-examination of aerial photographs during the desk-based assessment of the site did not confirm the identification, and indicated that this feature may be more recent and agricultural in origin (*ibid*).

Around 2km south of the site is a northeast-southwest aligned Roman road known as the Salt Way or Paundy Lane, thought to start in Barrow upon Soar and lead towards Grantham and Donington. Evidence for extensive Roman settlement remains has been identified on either side of the river at Barrow upon Soar and Quorn. Immediately across the river from the development site is a cropmark complex of rectangular ditched enclosures and other features (SMR No. LE463) which appears to extend from the present river edge to Catsick Hill, and from which metal detectorists have recovered Iron Age, Roman and later finds (Tann 2001).

The place-name Quorn or Quorndon is thought to mean 'hill from where quern stones came', and may refer to granite quarried at Buddon Wood.

The eastern boundary of the development site is defined by the Grand Union Canal which was opened in 1794.

Anecdotal evidence indicates a 19th to 20th century bottle dump in the vicinity of the site (D Hopkins pers. comm. 2004).

An archaeological evaluation of the

development site revealed prehistoric features at the west side of the site. These comprised part of a circular ditch, previously recorded as an anomaly in the magnetometer survey of the site. A second ditch was located *c.*130m to the northwest. Each of these produced pottery dating to the mid to late Iron Age, in addition to a small quantity of bone. Each of these ditches, dating to the 5th/4th to 1st century BC, were more fully exposed in the excavation and were shown to form two enclosures, one of which was sub-rectangular and the other circular. The finds retrieved from the site, including pottery, bone and part of a quern stone, are likely to reflect Iron Age occupation. (Mellor 2005).

A small assemblage of worked flints was retrieved during the archaeological evaluation on the site, including one from the primary fill of the circular ditch. This and the other flints have all been dated to the Bronze Age or Iron Age, with the exception of a core likely to be of Early Neolithic date (*ibid*).

A small amount of Roman pottery was recovered from subsoil deposits during the evaluation, although this is unlikely to indicate occupation of the site in this period.

Ridge and furrow was identified through cropmarks and geophysical survey of the site, indicating that at least part of the site was suitable for cultivation in the medieval period. The evaluation of the site confirmed traces of ridge and furrow in a number of trenches.

Post-medieval and later pottery, dating from the 17th to 20th centuries, recovered during the evaluation is likely to be associated continued cultivation of the land during this period.

3. AIMS

The requirements of the watching brief, as detailed in the specification (Appendix 1), were to locate and record archaeological deposits and, if present, to determine their date, function and origin.

In addition the watching brief was to determine the local contemporary environment and to characterise and date the paleaochannel, previously identified on the site.

4. METHODS

The site was stripped of topsoil using large tracked mechanical excavators with toothless ditching buckets. Topsoil and other overburden was moved around the site using large capacity dump trucks. The size and quantity of machinery on site presented a number of difficulties for monitoring as safety of site staff had be prioritised. All the groundworks were monitored and archaeological features and deposits were identified and recorded.

Each feature or deposit was allocated a unique reference number (context number) with an individual written description. A list of all contexts and their descriptions appears as Appendix 2. A photographic record was compiled and sections and plans were drawn at a scale of 1:10 or 1:20 respectively. Recording was undertaken according to standard Archaeological Project Services practice.

Following excavation the records were checked and a stratigraphic matrix produced. Phasing was assigned based on the nature of the deposits and recognisable relationships between them.

5. RESULTS

Archaeological contexts are listed below and described. The numbers in brackets are the context numbers assigned in the field.

The main sequence of events was dominated by a series of fluvial and alluvial deposits (Figures 5 & 6).

The earliest of these were layers of fluvial gravel and sandy gravel (1004), (1012) and (1025).

Traversing the site was a palaeochannel identified in several sections during the stripping of overburden (Figures 3, 6 & 7). In the northern edge of the site, the excavation of a relief drain revealed two locations where peat filled palaeochannels were exposed. Unfortunately the depth of water and the slope of the sides prevented these from being recorded in detail, although photographs were taken and their location noted on the site plan.

To the northeast a larger portion of the channel was observed in the edge of the excavations and two sample sections were recorded (Figure 6 & 7). The earliest channel deposit was a 0.05m thick layer of shelly silt (1024). This was overlain by a thin (0.05m thick) layer of gravel (1023). Two further layers of gravel (1022) and (1021) were also present with a further 0.55m of brown clay and silt (1020) above.

Lying within the channel, above the fluvial deposits of silt and gravel, was a 0.55m thick deposit of very dark grey silt with pebbles and frequent roots and twigs (1019) A sample was taken of this for further analysis and radio-carbon dating (Wheeler and Rackham; in Appendices 4 and 5). This deposit was also observed in Section 53 at the eastern corner of the excavation (1015).

Overlying (1019) and (1015) were layers of alluvium; 0.35m of grey alluvial clay (1018) and 015m of sandy gravel (1017) over (1019). Above (1015) was a 0.40m thick layer of grey and brown laminated silty clay (1014). The uppermost layer in these sections was up to 0.70m of brown alluvial silty clay (1016) and (1013).

Further alluvial deposits were recorded to the north of Section 53, in Section 52 (Figure 6). The earliest deposits were sand and gravel layers (1011) and (1012). Overlying these layers was a 0.60m thick deposit of grey and reddish brown sand (1010). Above this was 0.35m thick layer of mottled yellowish brown and bluish grey clayey sand (1009). This supports a 0.20m thick deposit of mixed mid grey and reddish brown sand (1008). A decayed peat layer (1007), 0.20m thick, was revealed above (1008) and possibly provides further evidence of the palaeochannel. The uppermost deposit (1006) was 0.80m of mottled bluish grey and brown silty clay.

In the western corner of the site, adjacent to excavation Area A, a curved linear feature (1003) was recorded in plan (Figure 4) and section (Figure 5). It was filled with mid brownish grey silty sand (1002). The linear feature was cut into natural gravel deposit (1004) and was sealed below 0.35m of orange-brown silty sand (1001) and topsoil (1000).

The portion of the site located around Area B was not excavated during the intensive part of the watching brief, but was buried beneath a spoil heap. After the watching brief was reduced in intensity by the Senior Planning Archaeologist, the groundworks were monitored intermittently. During this time, there was some confusion as to the location of Area B; whereby the extraction work in this area was not monitored.

6. DISCUSSION

The linear feature (1003), located adjacent to Area A was a continuation of the Iron Age enclosure that had been identified during the evaluation and excavation phases of this project. No finds were recovered from this feature, and no further features were identified with the area enclosed by the ditch. The absence of finds and features means that we cannot advance our interpretation of this feature further and we must still consider that a sub-rectangular enclosure is likely to have a number of possible functions including settlement, arable farming and stock management.

The mapping of the palaeochannel on the site was achieved by recording the deposits in section and combining this data with aerial photograph and micro-topographical data. The results of this are shown in Figure 3.

Palynological analysis of a column sample taken from the palaeochannel revealed a complex sequence of environmental and palaeoeconomical changes from the earlier Mesolithic through to the Bronze Age (Appendices 4 and 5).

The basal deposits of the channel were dated by Radiocarbon dating to 6690 to 6490 BC in the Mesolithic period and the pollen record suggested that the channel was rapidly flowing. The presence of fine charcoal particles could suggest land clearance by burning followed by soil erosion in this period.

The absence of data for the Neolithic period may be due to an erosional period in the channel's history. Alternative it may be due to a dry period in which the deposition of sediment was slow and the aerated conditions were particularly destructive to pollen.

The next sequence of pollen in the column that is positively dated, belongs to the Bronze Age. Two Radiocarbon dates give a range of 2200 to 2010 BC to 2000 to 1980 BC. Here the sequence suggests wetter conditions that form part of the general climatic deterioration seen in various sites across Britain. The pollen, fungal spore and plant macrofossil sequence suggest a developing human - environment relationship within the Bronze Age, resulting in managed pasture and the presence of grazing animals. Wider indicators suggest the continued use of burning as a form of land management although this became more selective over time.

The Iron Age linear feature was a continuation of the enclosure ditch revealed during the excavation phase of Area A. Unfortunately it was not possible to provide any further evidence to the function of the enclosure.

7. CONCLUSION

An intensive archaeological watching brief was undertaken on land at Pilling's Lock, Quorn, Leicestershire as the site contained a number of areas of archaeological activity dating to the Iron Age and earlier.

During the watching brief, the ancient course of the Soar river was revealed as a palaeochannel that was recorded in a number of sections. An environmental sample taken from one of these sections permitted the analysis of the pollen sequence providing insight into palaeoenvironmental and palaeoclimatic history of the channel, beginning in the Mesolithic and ending in the Bronze Age. The sequence showed that the flow of the river had been subject to periodic change and that the ecology of the area was transformed from scrubby woodland (subject to occasional clearance by fire) to more open pasture with land management and burning taking place within the wider area.

During the watching brief the enclosure ditch recorded in excavation Area A was mapped to the limits of the site.

A small quantity of post-medieval finds was recovered from the topsoil.

8. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of London Rock Supplies Ltd for commissioning the fieldwork and post-excavation analysis. The work was coordinated by Dale Trimble who edited this report along with Tom Lane. Dave Start kindly allowed access to the library maintained by Heritage Lincolnshire.

9. PERSONNEL

Project Coordinator: Dale Trimble
Site Supervisors: Aaron Clements & Vicki Mellor
Photographic reproduction: Sue Unsworth
Illustration: James Snee
Post-excavation analysis: James Snee

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11. ABBREVIATIONS

APS	Archaeological Project Services
BGS	British Geological Survey
IFA	Institute of Field Archaeologists
LAS	Lindsey Archaeological Services
OA	Oxford Archaeotechnics
OD	Ordnance Datum (height above sea level)

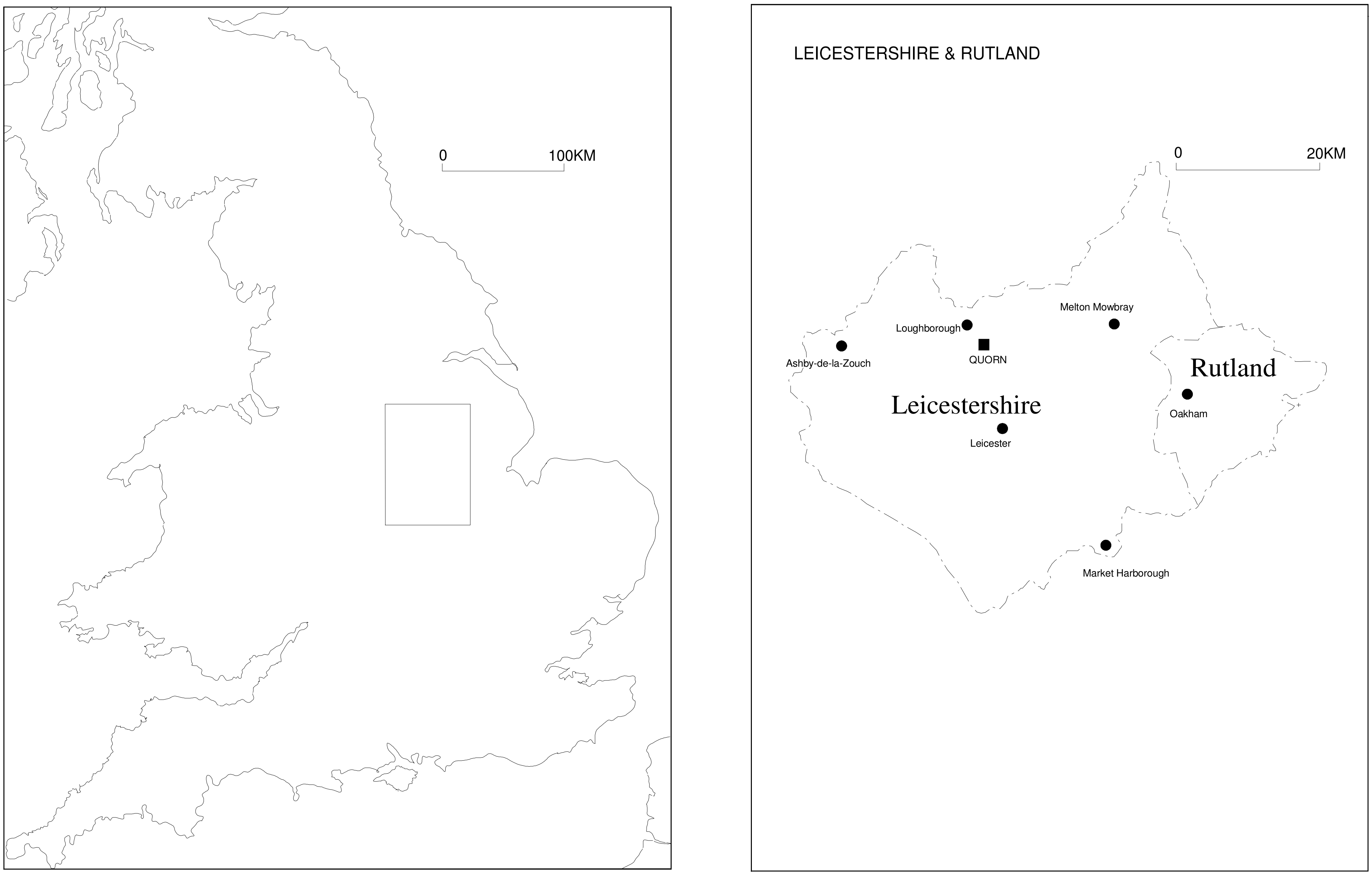


Figure 1: General location map

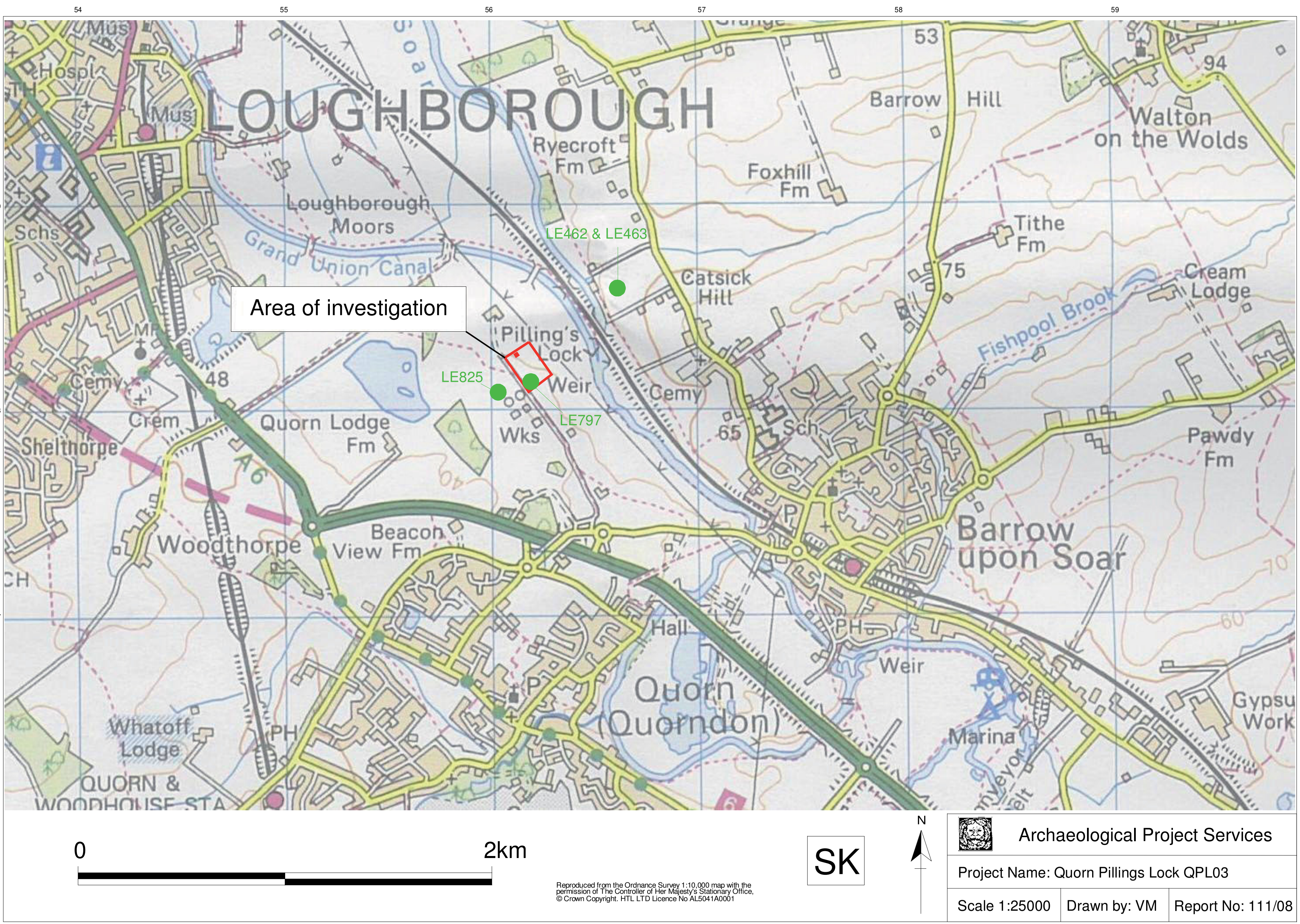


Figure 2 Site location map

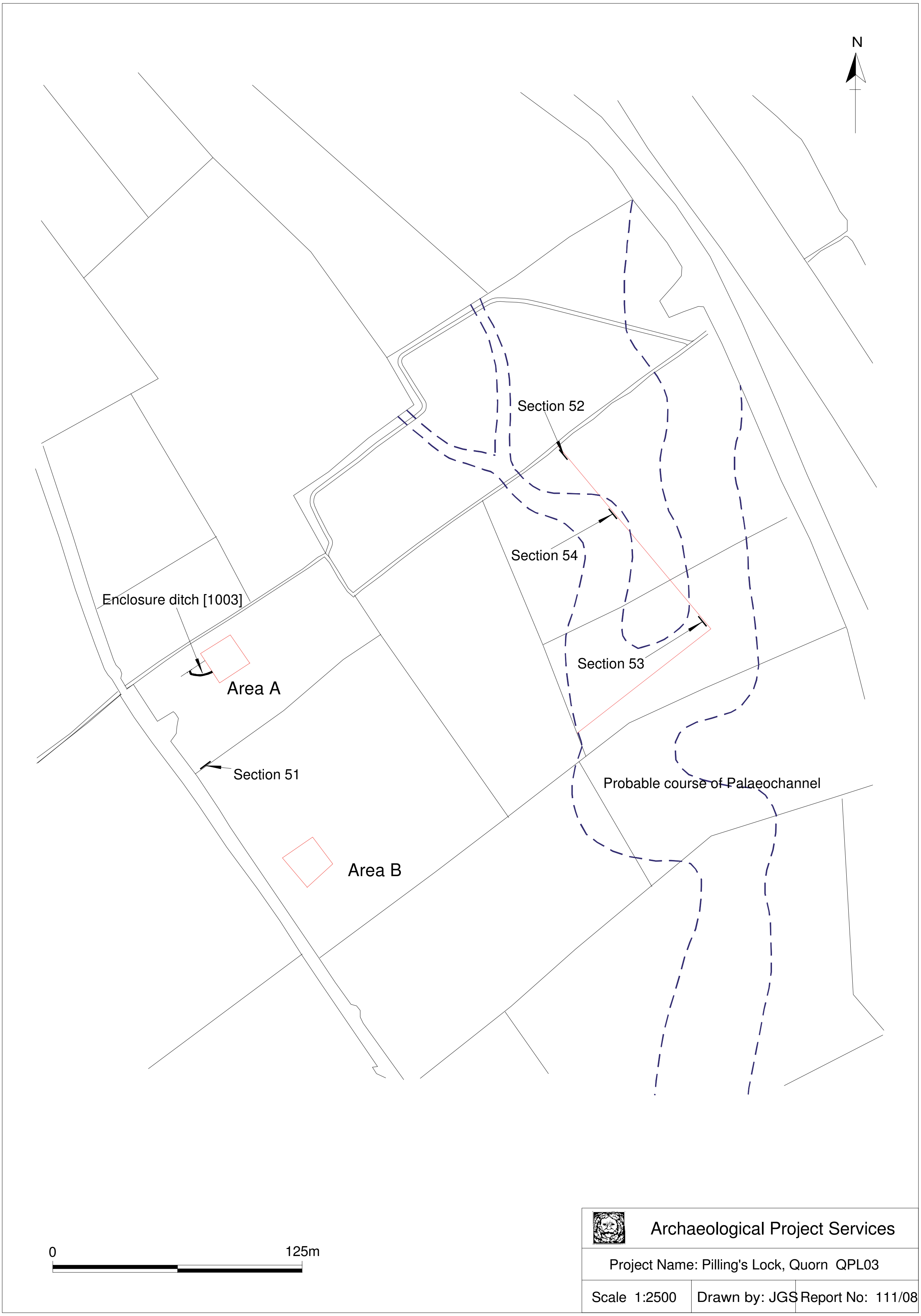


Figure 3 General site plan

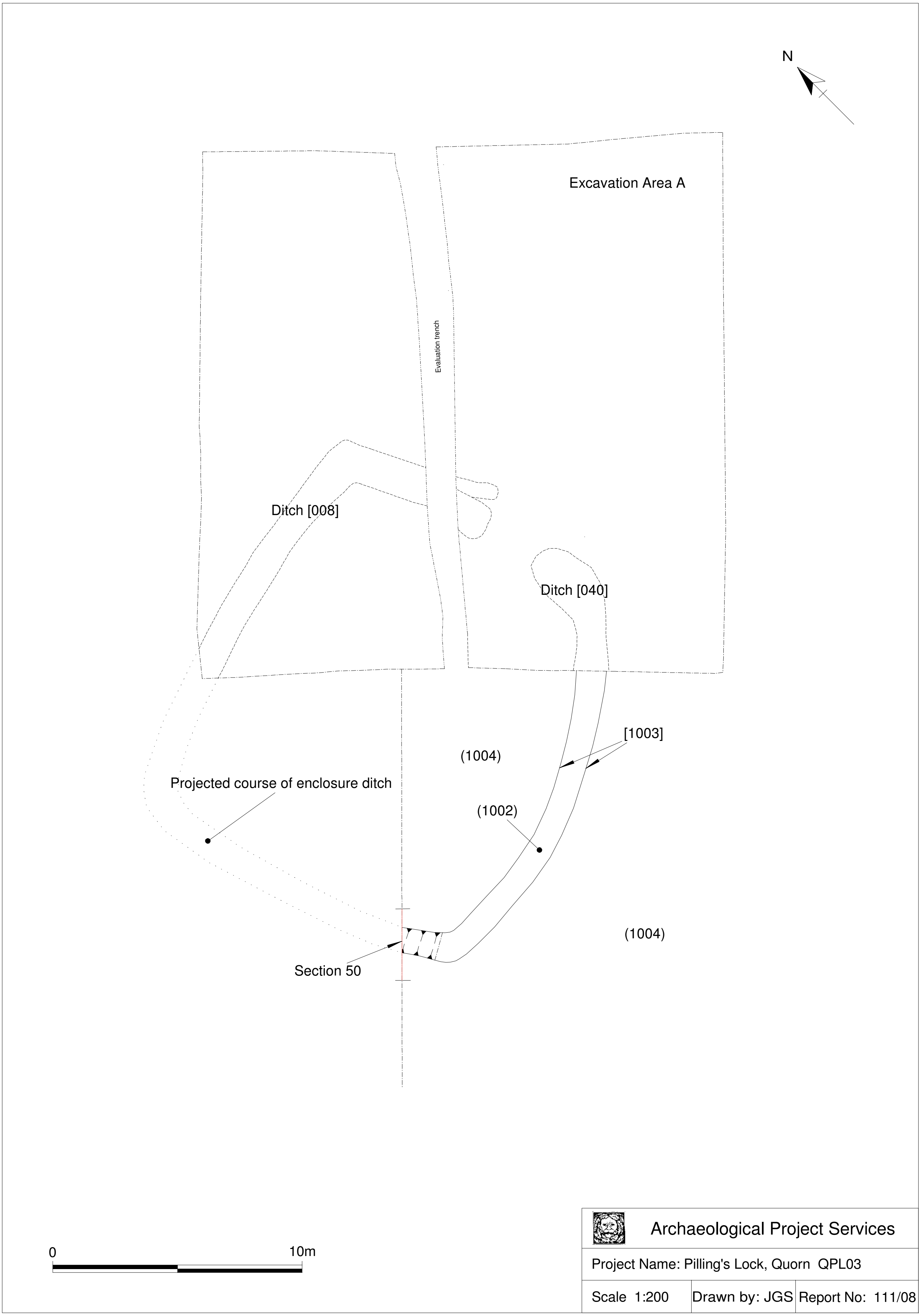


Figure 4 Plan of the enclosure ditch.

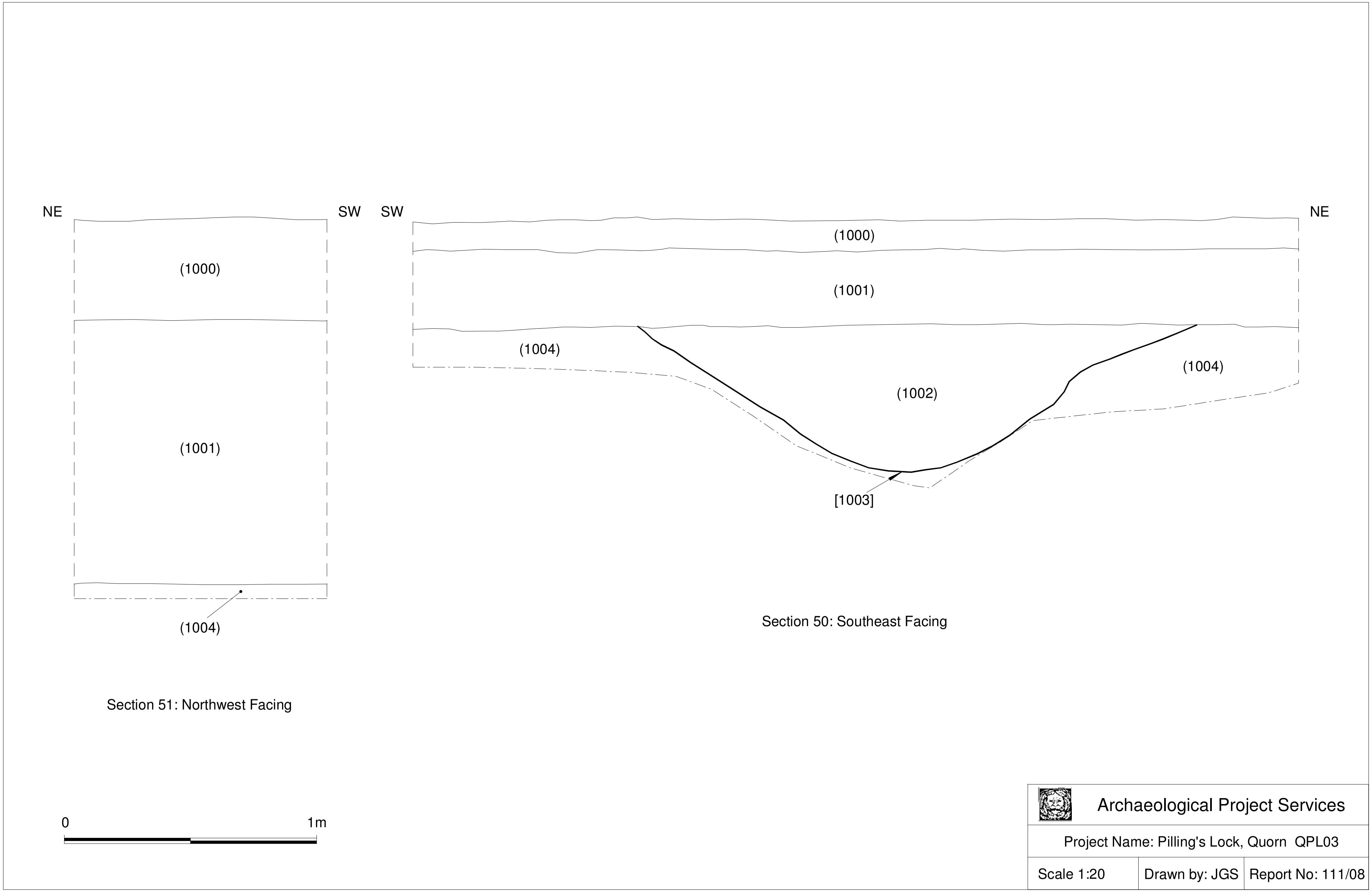
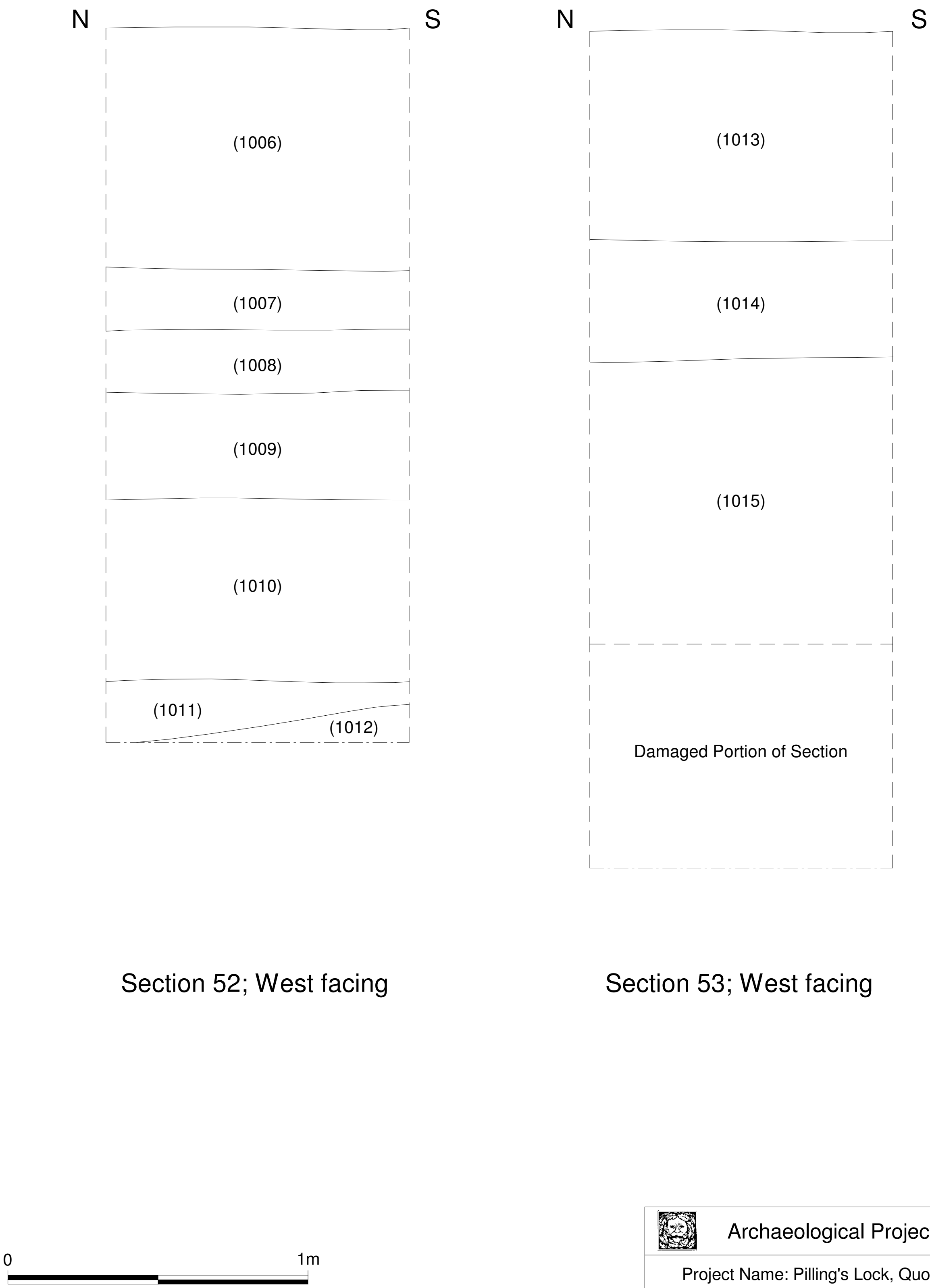


Figure 5 Sections 50 & 51



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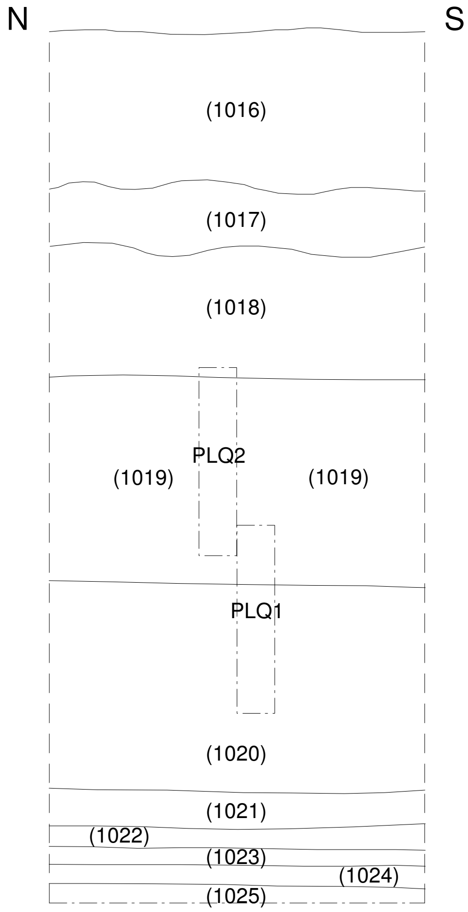
Project Name: Pilling's Lock, Quorn QPL03		
Scale 1:20	Drawn by:JGS	Report No: 111/08

Figure 6 Sections 52 & 53



Section 54: West facing

0 1m

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Project Name: Pilling's Lock, Quorn QPL03		
Scale 1:20	Drawn by:JGS	Report No: 111/08

Figure 7 Section 54

Plate 1 General view of enclosure ditch [1003], looking east.

Plate 2 Section through enclosure ditch [1003], looking northwest.

Plate 3 Section 52, looking northeast.

Plate 4 Section 53, looking northeast.

Plate 5 General view of extraction area showing the southeastern portion of the palaeochannel, looking north.

Appendix 1

LAND AT PILLINGS LOCK, QUORN, LEICESTERSHIRE
SPECIFICATION FOR ARCHAEOLOGICAL EXCAVATION AND WATCHING BRIEF

1 SUMMARY

1.1 *An archaeological excavation and watching brief is required in advance of mineral extraction at Pillings Lock, near Quorn, Leicestershire.*

1.2 *The site has been the subject of a Desk Based Archaeological Assessment that highlighted the archaeological potential of the site. As a result Leicestershire County Council requested a pre-determination archaeological evaluation to characterise any ancient deposits preserved on the site.*

1.3 *The archaeological evaluation identified the remains of an Iron Age ring ditch and associated features and a palaeochannel was also revealed on the eastern part of the site.*

1.4 *A brief outlining the requirements for further archaeological excavation and an intensive archaeological watching brief has been issued by the Senior Archaeological Officer of Leicestershire County Council Heritage Services. The excavation of two 20m x 20m areas and an intensive watching brief during topsoil stripping of the remaining areas of the quarry is required.*

1.5 *On completion of the fieldwork a report will be prepared detailing the results of the investigation. The report will consist of a narrative supported by illustrations and photographs.*

2 INTRODUCTION

2.1 This document comprises a specification for an archaeological excavation and watching brief on land at Pillings Lock, Quorn, Leicestershire, located at National Grid Reference SK562184.

2.2 This document contains the following parts:

2.2.1 Overview.

2.2.2 Stages of work and methodologies.

2.2.3 List of specialists.

2.2.4 Programme of works and staffing structure of the project

3 SITE LOCATION

3.1 Pillings Lock is located 2km north of Quorn and 2km east of Loughborough in Leicestershire at National Grid Reference SK562184.

3.2 The application area forms an approximately 8.7 hectare area located west of the Grand Union Canal.

4 PLANNING BACKGROUND

4.1 A Desk Based Archaeological Assessment commissioned by the applicant highlighted the archaeological potential of the site. As a result Leicestershire County Council advised that an archaeological evaluation of the site should be undertaken in advance of the determination of planning applications 02/01852/2 and 02/0257/2. The evaluation identified significant archaeological remains of Iron Age date, and a palaeochannel extending across the eastern part of the site. The Senior Planning Archaeologist of Leicestershire County Council Heritage Services has issued a brief outlining a requirement for the excavation of two 20m x 20m areas of the site, targeting the southwest end of the application area where an Iron Age ring gully and associated features were identified. An intensive archaeological watching brief during topsoil stripping on the remaining areas of the site is also required.

5 SOILS AND TOPOGRAPHY

5.1 The site lies within 500m of the Soar River at around 40m OD. The underlying drift geology comprises sands and gravels deposited during the post glacial period. Solid geology within the application area comprises Keuper Marl.

6 ARCHAEOLOGICAL OVERVIEW

6.1 The earliest remains from the area comprise fragments of woolly rhino, mammoth and a possible hand axe of Palaeolithic date, discovered during extraction at the Quorn Gravel Pit. These whereabouts of these artefacts cannot be traced and they are known only from written records (LAS report 552)

6.2 Prehistoric remains ranging in date from the Mesolithic to Iron Age periods are known from the Quorn and Barrow on Soar areas and are recorded in the Leicestershire and Rutland Sites and Monuments record.

6.3 Archaeological evaluation of the site identified the remains of a *c.* 15m diameter Iron Age ring ditch and associated features. The ditch probably represents the remains of ditch surrounding a round house, suggesting domestic occupation of the site. Pottery retrieved from the site dates from the middle to late Iron Age.

6.4 A palaeochannel thought to represent an early confluence of the River Soar was recorded over the eastern section of the site. Environmental samples taken from the fills of the channel were thought to be contaminated and were not analysed for pollen remains.

7 AIMS AND OBJECTIVES

7.1 The aim of the project is to effectively preserve the archaeological resource within specified areas of the application area by means of excavation and full recording, interpretation and reporting of archaeological features.

7.2 To attain this aim the following broad objectives will be fulfilled:

- to identify and excavate significant archaeological features
- to retrieve relevant structural/stratigraphic, artefactual and environmental data
- to determine the date and function of individual features and of the site as a whole
- to determine the functional diversity of features excavated
- to determine the local contemporary environment, identify changes therein through time and interpret the reason for changes
- to determine the economic base of the site and changes therein through time

8 EXCAVATION

8.1 <u>General Considerations</u>

8.1.1 All work will be undertaken following statutory Health and Safety requirements in operation at the time of the investigations.

8.1.2 The work will be undertaken according to the relevant codes of practice issued by the Institute of Field Archaeologists (IFA). *Archaeological Project Services* is an IFA Registered Archaeological Organisation (No. 21).

8.1.3 Any and all artefacts found during the investigation and thought to be 'treasure', as defined by the Treasure Act 1996, will be removed from site to a secure store and promptly reported to the appropriate coroner's office.

8.2 Methodology

8.2.1 Two areas measuring 20m x 20m located towards the southwest side of the application area as shown on the attached plan will be excavated.

8.2.2 Removal of the topsoil will be undertaken by mechanical excavator using a toothless ditching bucket. To ensure that the correct amount of material is removed and that no archaeological deposits are damaged, this work will be supervised by Archaeological Project Services. Thereafter, excavation will be by hand to enable the identification and analysis of the archaeological features exposed.

8.2.3 Investigation of the archaeological features exposed will be undertaken in order to determine their date, form and function and will be undertaken in accordance with the sampling criteria laid out below. The level of sampling may be varied depending on the state of preservation but it is envisaged that features on site be subject to intensive sampling, as defined below.

8.2.4 Archaeological features encountered will be recorded on Archaeological Project Services pro-forma context record sheets. The system used is the single context method by which individual archaeological units of stratigraphy are assigned a unique record number and are individually described and drawn.

8.2.5 Plans of features will be drawn at a scale of 1:20 and sections at a scale of 1:10. Should individual features merit it, they will be drawn at a larger scale.

8.2.6 Throughout the duration of the investigation a photographic record consisting of black and white prints (reproduced as contact sheets) and colour slides will be compiled. The photographic record will consist of:

- the site before the commencement of field operations.
- the site during work to show specific stages of work, and the layout of the archaeology in specific areas.
- individual features and, where appropriate, their sections.
- groups of features where their relationship is important.
- the site on completion of field work

8.2.7 Finds collected during the fieldwork will be bagged and labelled according to the individual deposit from which they were recovered ready for later washing and analysis. A metal detector may be used to assist artefact recovery.

8.2.8 The precise location of features within the site and the location of site recording grid will be established by an EDM survey.

8.3 Sampling criteria

8.3.1 Enclosure and linear ditches:

- Non-intensive - 5% of exposed length, targeted at intersections, entrances/terminals and in evenly spaced sections along their length.

- Intensive - up to 10% sample of exposed length.

8.3.2 Ring/curvilinear ditches:

- Non-intensive - 25% of each feature targeted at entrances/ terminals, a section diametrically opposed to the entrance causeway and sections at the mid-point of each side.

- Intensive - increase sampling level to up to 50%.

8.3.3 Timber structures represented by postholes, beam slots etc:

- Non-intensive - 50% of postholes/structural features to be half-sectioned.

- Intensive - increase sample to 100%; Structures with high quality evidence for the nature of wall construction - full excavation; Structures with *in-situ* floors - full excavation with 3-dimensional spatial recording of finds.

8.3.4 Pits:

- For non-intensive excavation of individual pits or small groups of pits, 50% of pits will be half-sectioned.

- Intensive excavation - increase sampling level to 100%; full excavation of particularly well-preserved or potentially informative features.

8.3.5 Burials. Whether inhumation or cremation, all burials will necessitate full and detailed excavation. This will be undertaken under appropriate Home Office and environmental health regulations.

8.3.6 Special deposits: any deposits of particular importance - e.g. potential ritual deposits, large closely stratified pottery assemblages, good environmental deposits etc. will require full excavation.

9 WATCHING BRIEF

9.1 A watching brief will be undertaken during stripping of topsoil and alluvium over the remainder of the site. Should revealed archaeological deposits in this area warrant intensive excavation over that possible during the monitoring, a revision to allocated resources will be required, in line with the requirements of the curatorial archaeologist.

9.2 Section drawings of excavated archaeological features be recorded at a scale of 1:10. Should features be recorded in plan these will be drawn at a scale of 1:20. Written descriptions detailing the nature of the deposits, features and fills encountered will be compiled on Archaeological Project Services pro-forma record sheets.

9.3 Any finds recovered will be bagged and labelled for later analysis.

9.4 Throughout the watching brief a photographic record will be compiled. The photographic record will consist of:

9.4.1 the site during work to show specific stages, and the layout of the archaeology within the stripped area.

9.4.2 groups of features where their relationship is important

9.5 Should suitable deposits for environmental sampling be identified within the palaeochannel recorded during the evaluation, the advice of an environmental will be sought and appropriate samples taken. These may include samples for the analysis of pollen, macro-botanical and micro faunal remains. As the environmental potential of the palaeochannel cannot be assessed in advance, these will appear as a contingency in all costings for the project and will only be activated after consultation with the client and the curatorial archaeologist.

10 POST-EXCAVATION AND REPORT

10.1 Stage 1

10.1.1 On completion of site operations, the records and schedules produced during all phases of the archaeological investigation and recording will be checked and ordered to ensure that they form a uniform sequence constituting a level II archive. A stratigraphic matrix of the archaeological deposits and features present on the site will be prepared. All photographic material will be catalogued: the colour slides will be labelled and mounted on appropriate hangers and the black and white contact prints will be labelled, in both cases the labelling will refer to schedules identifying the subject/s photographed.

10.1.2 All finds recovered during the trial trenching will be washed, marked, bagged and labelled according to the individual deposit from which they were recovered. Any finds requiring specialist treatment and conservation will be sent to the Conservation Laboratory at the City and County Museum, Lincoln.

10.2 Stage 2

10.2.1 Detailed examination of the stratigraphic matrix to enable the determination of the various phases of activity on the site.

10.2.2 Finds will be sent to specialists for identification and dating.

10.3 Stage 3

10.3.1 On completion of stage 2, a report detailing the findings of the investigation will be prepared. This will consist of:

- A non-technical summary of the findings of the investigation.
- A description of the archaeological setting of the site, referring to previous archaeological work on the site.
- Description of the topography and geology of the application area.
- Description of the methodologies used during the investigations and discussion of their effectiveness in the light of the findings of the investigation.
- A text describing the findings of the investigation and recording.
- Plans of the excavation and watching brief areas showing the archaeological features exposed. If a sequence of archaeological deposits is encountered, separate plans for each phase will be produced.
- Sections of the trenches and archaeological features.
- Interpretation of the archaeological features exposed and their context within the surrounding landscape.
- A table summarizing the archaeological contexts identified and recorded on the site.

- Specialist reports on the finds from the site including a table of all finds specifying context, material and date.

- Appropriate photographs of the site and specific archaeological features or groups of features.

- A consideration of the significance of the remains found, in local, regional, national and international terms, using recognised evaluation criteria.

10.4 The watching brief report will be included as an appendix to the Excavation report and its conclusions integrated into the results of the Excavation.

11 ARCHIVE

11.1 The documentation, finds, photographs and other records and materials generated during the investigation will be sorted and ordered into the format acceptable to Lecestershire County Museum and in line with guidelines published in *UKIC Guidelines for the preparation of archives for long term storage (1990)* and *The transfer of Archaeological Archives to LMARS (LMARS 2001)..*

12 REPORT DEPOSITION

12.1 Copies of the evaluation report will be sent to: the Client, the Leicestershire County Council Archaeology Service; Leicestershire County Council Planning Department; and the Leicestershire County Sites and Monuments Record.

13 PUBLICATION

13.1 A report of the findings of the evaluation will be submitted to the editor of the Transactions of the Leicestershire Archaeological and Historical Society. If appropriate notes or articles describing the results of the investigation will also be submitted for publication in the appropriate national journals: Proceedings of the Prehistoric Society for discoveries of prehistoric date; Britannia for discoveries of Roman date; and Medieval Archaeology and Journal of the Medieval Settlement Research Group for medieval and later remains.

14 CURATORIAL MONITORING

14.1 Curatorial responsibility for the project lies with the Senior Planning Archaeologist of Leicestershire County Council Heritage Services. As much written notice as possible, ideally at least seven days, will be given to the archaeological curator prior to the commencement of the project to enable them to make appropriate monitoring arrangements.

15 VARIATIONS TO THE PROPOSED SCHEME OF WORKS

15.1 Variations to the scheme of works will only be made following written confirmation from the archaeological curator.

15.2 Should the archaeological curator require any additional investigation beyond the scope of the brief for works, or this specification, then the cost and duration of those supplementary examinations will be negotiated between the client and the contractor.

16 SPECIALISTS TO BE USED DURING THE PROJECT

16.1 The following organisations/persons will, in principle and if necessary, be used as subcontractors to provide the relevant specialist work and reports in respect of any objects or material recovered during the investigation that require their expert knowledge and input. Engagement of any particular specialist subcontractor is also dependent on their availability and ability to meet programming requirements.

Task	Body to be undertaking the work
Conservation	Conservation Laboratory, City and County Museum, Lincoln.
Pottery Analysis	All periods: University of Leicester Archaeological Services
Other Artefacts	University of Leicester Archaeological Services
Human Remains Analysis	University of Leicester Archaeological Services
Animal Remains Analysis	University of Leicester Archaeological Services

17 PROGRAMME OF WORKS AND STAFFING LEVELS

17.1 The excavtion fieldwork will be undertaken by 4 staff, a Project Officer and three assistants. It is expected that the work will take 10 days, five days for each 20m x 20m area. The duration of the watching-brief fieldwork is dependent on the progress of the topsoil stripping.

17.2 A project officer or supervisor will undertake most of the post-excavation production is expected to take 20 person-days within a notional programme of 25 days.

17.3 The watching brief will be undertaken by an APS project officer experienced in the stripping of topsoil and alluvium on gravel sites. An assistant will be required to map and record features using a Total Station EDM and to undertake excavation and recording of revealed archaeological deposits. Additional staff may be required if the level of excavation and recording exceeds that possible during the watching brief.

18 INSURANCES

18.1 Archaeological Project Services, as part of the Heritage Trust of Lincolnshire, maintains Employers Liability insurance to 10,000,000. Additionally, the company maintains Public and Products Liability insurances, each with indemnity of 5,000,000. Copies of insurance documentation can be supplied on request.

19 COPYRIGHT

19.1 Archaeological Project Services shall retain full copyright of any commissioned reports under the Copyright, Designs and Patents Act 1988 with all rights reserved; excepting that it hereby provides an exclusive licence to the client for the use of such documents by the client in all matters directly relating to the project as described in the Project Specification.

19.2 Licence will also be given to the archaeological curators to use the documentary archive for educational, public and research purposes.

19.3 In the case of non-satisfactory settlement of account then copyright will remain fully and exclusively with Archaeological Project Services. In these circumstances it will be an infringement under the Copyright, Designs and Patents Act 1988 for the client to pass any report, partial report, or copy of same, to any third party. Reports submitted in good faith by Archaeological Project Services to any Planning Authority or archaeological curator will be removed from said Planning Authority and/or archaeological curator. The Planning Authority and/or archaeological curator will be notified by Archaeological Project Services that the use of any such information previously supplied constitutes an infringement under the Copyright, Designs and Patents Act 1988 and may result in legal action.

19.4 The author of any report or specialist contribution to a report shall retain intellectual copyright of their work and may make use of their work for educational or research purposes or for further publication.

20 BIBLIOGRAPHY

Leicestershire County Council Heritage Servcies, 2003, *Brief for Archaeological Excavation of Land At Pillings Lock, Quorn*

Specification Version 1 18th July 2003

Appendix 2

Context Summary

Context No:	Section No:	Description:	Interpretation:
1000	50	Friable, mid brownish grey sandy silt, with moderate gravel, *c.* 0.12m thick	Topsoil.
1001	50	Friable, mid orange-brown gravelly silty sand, *c.*0.35m thick.	Subsoil.
1002	50	Friable, mid brownish grey silty sand, with frequent gravel.	Fill of enclosure ditch [1003].
1003	50	Curvilinear cut, 2.20m wide and 0.60m deep, with sloping sides and a rounded base.	Enclosure ditch.
1004	50	Friable, yellowish-orange silty sand and gravel, > 0.40m thick.	Natural gravel.
1005	50	Large Granite fragment.	Possible marker stone.
1006	52	Firm, mottled mid bluish grey & brown silty clay, 0.80m thick.	Alluvium.
1007	52	Soft, black clayey silt with occasional pea gravel, 0.20m thick.	Decayed peat layer.
1008	52	Friable, mixed mid grey and reddish brown sand with occasional pea gravel, 0.20m thick.	Alluvium.
1009	52	Firm, mottled mid yellowish brown & blue grey clayey sand with moderate pea gravel, 0.35m thick.	Alluvium.
1010	52	Friable, mid grey & reddish brown sand with occasional pea gravel, 0.60m thick.	Alluvium.
1011	52	Firm, mid grey silty sand and gravelly clay, frequently iron stained, > 0.20m thick.	Alluvium.
1012	52	Firm, mid grey silty sand and gravel, frequently iron stained, > 0.15m thick.	Alluvium.
1013	53	Firm, mid brownish grey silty clay, 0.7m thick.	Alluvium.
1014	53	Firm, mottled mid bluish grey & brown laminated silty clay, 0.40m thick.	Alluvium.
1015	53	Soft/friable, dark brown to black peat with frequent wood fragments, > 1m thick.	Fill of river channel.
1016	-	Light brown alluvial clay, 0.42m thick.	Alluvium.
1017	-	Sandy gravel, 0.15m thick.	Palaeochannel deposit.
1018	-	Grey alluvial clay, 0.35m thick.	Palaeochannel deposit.
1019	-	Very dark grey silt with pebbles and lots of	Palaeochannel

		root penetration, 0.55m thick.	deposit.
1020	-	Light grey brown clay/silt with some stones, 0.55m thick.	Palaeochannel deposit.
1021	-	Gravel, 0.05m thick.	Palaeochannel deposit.
1022	-	Red gravel, 0.10m thick.	Palaeochannel deposit.
1023	-	Gravel, 0.05m thick.	Palaeochannel deposit.
1024	-	Thin shelly silt band, 0.05m thick.	Palaeochannel deposit.
1025	-	Gravel, 0.05m thick.	Natural alluvium.

Appendix 3

THE FINDS

INTRODUCTION

A small number of finds, comprising 20 items weighing 323 grams, were recovered from a single context. The material consists of early modern pottery, glass and iron.

POST ROMAN POTTERY

By Anne Boyle

Introduction

All the material was recorded at archive level in accordance with the guidelines laid out in Slowikowski *et al.* (2001). The pottery codenames (Cname) are in accordance with the Post Roman pottery type series for Lincolnshire, as published in Young *et al.* (2005) and the equivalent codenames for Leicestershire are shown in Table 1 (Sawday 2008). A total of 17 sherds from 12 vessels, weighing 163 grams were recovered from the site.

Methodology

The material was laid out and viewed in context order. Sherds were counted and weighed by individual vessel within each context. The pottery was examined visually and using x20 magnification. This data was then added to an Access database. An archive list of the pottery is included in Archive Catalogue 1 and a summary is included in Table 1. The pottery dates to the early modern period.

Condition

Overall, the pottery is in fresh condition and the average sherd weight is 10 grams.

Results

Table 1, Post Roman Pottery Archive

Cname	Full name	Leics	Earliest	Latest	NoS	NoV	W (g)

		cname	date	date			
CREA	Creamware	EA8	1770	1830	1	1	6
ENPO	English Porcelain	PO	1750	1900	1	1	3
NOTS	Nottingham stoneware	SW3	1690	1900	2	1	58
PEARL	Pearlware	EA9	1770	1900	8	6	56
STMO	Staffordshire/Bristol mottled-glazed	EA3	1670	1800	4	2	36
WHITE	Modern whiteware	EA10	1850	1900	1	1	4
				TOTAL:	**17**	**12**	**163**

Provenance

All the material came from topsoil (1000).

Range

The range of ware types is typical of assemblages dating from the 18th to the early 20th century.

Potential

None of the pottery poses any problems for long term storage. No further work is required.

Summary

A small group of early modern pottery was recovered from the site, indicating recent activity occurring in the vicinity.

GLASS

By Gary Taylor

Introduction

Two pieces of glass together weighing 62g were recovered.

Condition

Although naturally fragile, the glass is in good archive-stable condition.

Results

Table 2, Glass Archive

Cxt	Description	NoF	W (g)	Date

1000	Dark green bottle, steep kick-up, 20th century	1	51	20th century
	Dark olive green bottle, gob top, 19th-early 20th century	1	11	

Provenance

Both pieces of glass were recovered from the topsoil.

Range

Both pieces of glass were from bottles of slightly different, though early modern, date.

Potential

As early modern material from the topsoil, the glass is of very limited potential.

OTHER FINDS

By Gary Taylor

Introduction

A single piece of iron weighing 98g was recovered.

Condition

The object is corroded but is otherwise in good condition.

Results

Table 3, Other Materials

Cxt	Material	Description	NoF	W (g)	Date
1000	Iron	Bolt?	1	98	

Provenance

The single other artefact was retrieved from the topsoil.

Range

Only one item was found, a probable iron bolt.

Potential

As an item of uncertain function and date recovered from the topsoil, the object is of very limited potential.

SPOT DATING

The dating in Table 4 is based on the evidence provided by the finds detailed above.

Table 4, Spot dates

Cxt	Date	Comments
1000	19th to 20th	

ABBREVIATIONS

BS	Body sherd	NoS	Number of sherds
CXT	Context	NoV	Number of vessels
NoF	Number of Fragments	W (g)	Weight (grams)

REFERENCES

Sawday, D., 2008, *List of Leicestershire Pottery Codename*, unpublished.

Slowikowski, A. M., Nenk, B., and Pearce, J., 2001, *Minimum Standards for the Processing, Recording, Analysis and Publication of Post-Roman Ceramics*, Medieval Pottery Research Group Occasional Paper 2

Young, J., Vince, A.G. and Nailor, V., 2005, *A Corpus of Saxon and Medieval Pottery from Lincoln* (Oxford)

ARCHIVE CATALOGUES

Archive catalogue 1, Post Roman Pottery

Cxt	Cname	Form	NoS	NoV	W (g)	Decoration	Part	Description	Date
1000	CREA	Plate/ dish/ bowl	1	1	6	Blue/black transfer print	BS		Mid/late 18th to early 19th
1000	ENPO	Cup/ tea bowl	1	1	3	Blue transfer print	Rim		18th to 19th
1000	NOTS	Jar	2	1	58		Rim + BS		19th
1000	PEARL	?	2	2	8	Blue transfer print	Base + BS	Abraded	Late 18th to 19th
1000	PEARL	?	3	1	11	Blue transfer print	Base		Late 18th to 19th
1000	PEARL	Hollow	1	1	4	Blue sponge design?	BS		Mid/late 18th to early 19th
1000	PEARL	Dish/ bowl	1	1	24	Blue transfer print	Base	Worn base	Late 18th to 19th
1000	PEARL	Plate/ dish/ bowl	1	1	9	Blue transfer print	Rim	Abraded	Late 18th to 19th
1000	STMO	?	1	1	10		Base		18th
1000	STMO	Jar/	3	1	26		BS	Internally worn	18th

		chamber							
1000	WHITE	Hollow	1	1	4		BS		19th to 20th

Appendix 4

Palynological assessment of two monoliths from a palaeochannel at Pillings Lock Quarry, Quorn, Leicestershire (SK 562184) (site code: QPL03)

by

Jane Wheeler

1. Introduction

In 2005 the Environmental Archaeology Consultancy was commissioned to undertake environmental sampling and initial AMS radiocarbon dating of palaeochannel deposits exposed at Pillings Lock Quarry (SK 562184). The site is located to the immediate northwest of Pillings Lock on the Grand Union Canal, and east of the A6 and west of the train mainline to the north of Quorn in Leicestershire. The 232cm high section revealed by plant in the quarry face was sampled by taking 2 x 50cm long monoliths (see Plate 1). The upper monolith (monolith 1) overlapped the underlying monolith (monolith 2) by 8cm, thus the total depth sampled within the section was 92cm (between 50-100cm and 92-142cm) which was contained between the basal (0-50cm) and the upper deposits (142-232cm) of the palaeochannel, spanning the grey brown clay/silt and dark grey silt sequences (Rackham 2005). Two bulk samples were also taken from a basal shelly band at 5cm-10cm and the organic dark grey silts at 100-105cm (Rackham 2005). Twigs from the latter, at 100-105cm, provided a preliminary AMS radiocarbon date of 3720 ± 40BP (Beta-209081) and the channel feature was interpreted as being the early Bronze Age coarse of the River Soar (Rackham 2005), whose current course lies approximately 100 metres to the east of the site.

Plate 1. Section of the palaeochannel at Pillings Lock Quarry showing the stratigraphy and the position of the two monoliths taken from the clay/silt and silt

sequence (Photo: D.J. Rackham) – approximate grid reference for sample site is SK 563184.

The survival of wood fragments at 100-105cm in conjunction with an early Bronze Age radiocarbon date indicated the potential that the stratigraphic sequence could provide palynological data to enable the palaeoenvironmental history of this former section of the River Soar to be investigated (Rackham 2005), at least for part of the Bronze Age. Deposits of similar date from other river valley palaeochannels in the East Midlands and from upland peats in the Peak District have been investigated (the bulk of this palaeoenvironmental work in North Derbyshire, Nottinghamshire, Leicestershire, Lincolnshire and Northamptonshire is summarised in Clay 2006, 73-74; and Monckton 2006, 265-269). Palaeoenvironmental work has recently been conducted at Narborough Bog (Brown 2000, 59), Thurlston Brook at Croft (Smith *et al*. 2005), and along with Brown and Keough's (1992) research in the Soar valley (which presented a model to demonstrate the relationships between the geoarchaeological potential of floodplains and their evolution as sedimentary systems) work pertinent to the River Soar is limited. More palaeoenvironmental evidence from the Soar valley, particularly in relation to the distribution of woodland and clearance dates in the early-middle Bronze Age, is therefore required to provide further data-sets to help establish a palaeoenvironmental history for the Soar valley (Monckton 2006, 266-267; Rackham 2005).

Depth (cm)	Sediment description
232	Topsoil stripped off
190-232	Light brown clay
175-190	Sandy gravel
135-175	Dark greyish brown sandy silty clay with organic inclusions – fine longitudinally running root fibres
130-135	Dark brown sandy clayey silt with organic inclusions – fine longitudinally running root fibres
115-130	Very dark brown clayey silt with inclusions of sandstone (≤ 8mm x 5mm), angular gravel (3mm x 2.5mm), and organic matter – fine longitudinally running root fibres
100-115	Black clayey silt with inclusions of pebbles (≤ 10mm x 10mm), sub-angular sandstone (≤ 10mm x 9mm), and organic matter – fine longitudinally running root fibres
90-100	Dark brown clayey silt with inclusions of pebbles (≤ 10mm x 6mm), angular and sub-angular gravel (≤ 5mm x 3mm), and organic matter – rootwood and fine root fibres
80-90	Very dark brown sandy clayey silt with inclusions of angular and sub-angular gravel (≤ 7mm x 4mm), and organic matter – fine root fibres
30-80	Brown sandy clay with inclusions of sub-angular (≤ 20mm x 6mm) and rounded gravel (≤ 5mm x 4mm) and organic matter – rootwood and root fibres
25-30	Gravel
15-20	Red clay
10-15	Gravel
5-10	Thin shelly silt band
0-5	Gravel

Table 1. Stratigraphic sequence of deposits recorded in the quarry face section.

Depth (cm)	Lab. Ref.	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age	Calibrated date range (95.4%) OxCal/IntCal04 (Reimer *et al.* 2004)
129-130	Beta – 228377	3760 ± 40 BP	-28.2 o/oo	3710 ± 40 BP	2271 cal BC – 1977 cal BC
100-105	Beta – 209081	3770 ± 40 BP	-27.9 o/oo	3720 ± 40 BP	2776 cal BC – 1980 cal BC
83-84	Beta – 228376	7810 ± 50 BP	-26.9 o/oo	7780 ± 50 BP	6696 cal BC – 6476 cal BC

Table 2. AMS radiocarbon dates (Beta Analytic Inc. Radiocarbon Dating Laboratory, Miami, Florida) and calibrated date ranges.

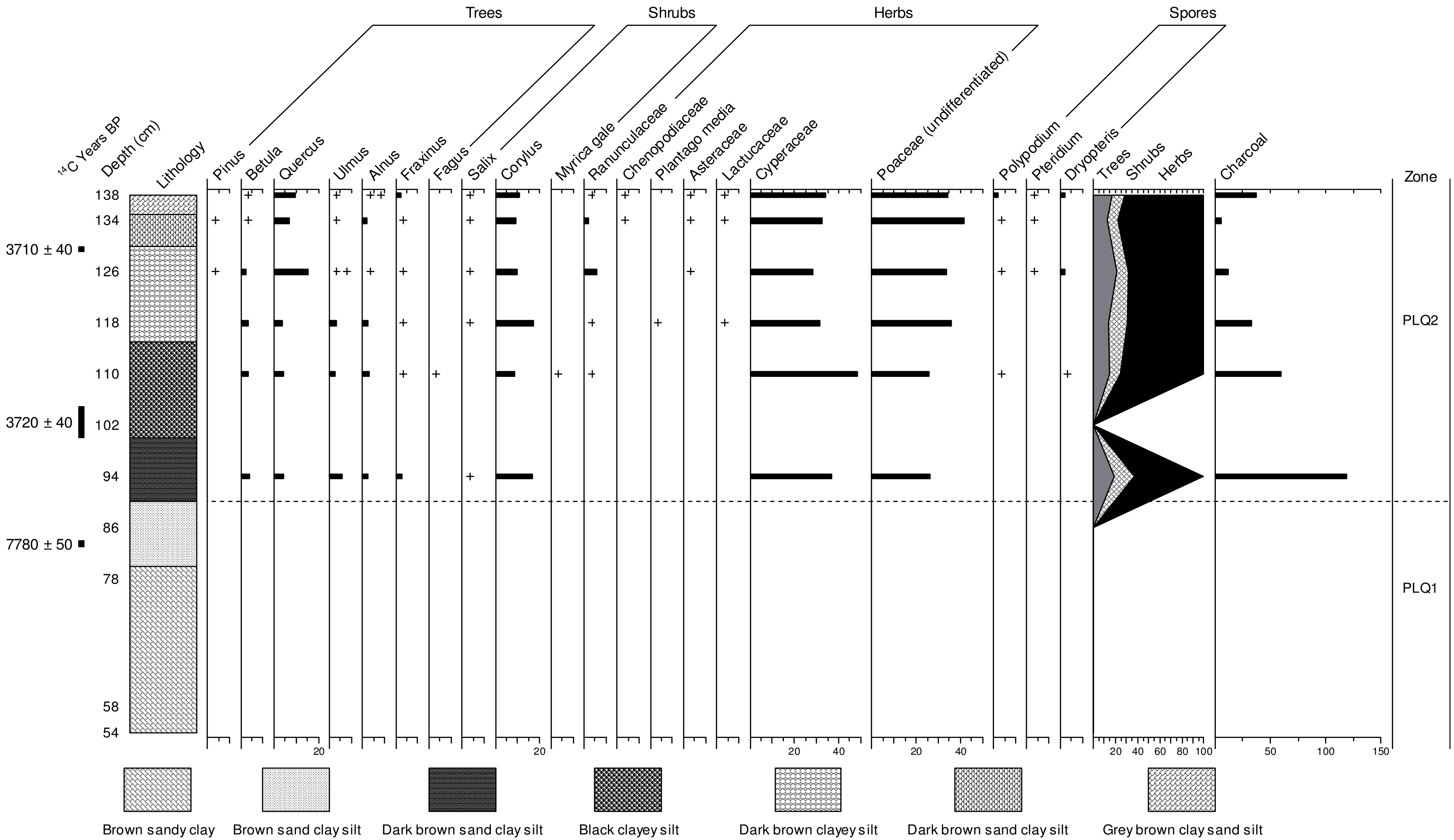

Figure 1. Pollen and palaeopollutant spectra from the Mesolithic and early Bronze Age deposits from Pillings Lock Quarry, Quorn, Leicestershire

As a result of the initial early Bronze Age AMS radiocarbon date at 100-105cm and the potential for micro-fossil preservation within the deposits revealed in the overall monolith sequence (50-142cm) (see Table 1), two additional sediment samples were taken at 83-84cm and 129-130cm in the monolith and submitted for dating. The lower deposit at 83-84cm produced a Mesolithic date of 7780 ± 50BP (Beta – 228376), whilst the higher deposit at 129-130cm yielded an early Bronze Age date (3710 ± 40BP – Beta 228377. The proximity of the two early Bronze Age dates within the 24cms of sediment (105-129cm) comprising clayey silt with inclusions of pebbles and gravel appears indicative of fluctuating fluvial velocity and sedimentation during a relatively short period in the Bronze Age, whilst the underlying late Mesolithic date at 83-84cm, 16cm beneath the older of the two early Bronze Age dates, indicates a hiatus in the lithology between 84-100cm. A palynological assessment of the monolith sequence was subsequently conducted by the Environmental Archaeology Consultancy to determine if sub-fossil pollen and other ecofactual data were present in an attempt to define when and why the hiatus occurred, and to present palaeoenvironmental evidence for the vegetational history of this local site on the Soar floodplain in prehistory.

2. Pollen analysis

Sub-samples of $1cm^3$ of sediment were taken at 4cm intervals between 54-58cm and 74-94cm from monolith 2, and 94-138cm from monolith 1. The two basal sub-samples at 54cm and 58cm were taken to ascertain firstly if sub-fossil pollen was present, and secondly, to determine if the local pollen picture was reflective of periglacial and/or post-glacial environments. Whilst 4cm sub-samples were taken, the initial analysis of the monolith sequence assessed the material at standard resolution intervals of 8cm, with the exception of the uppermost sub-sample at 138cm, to gauge the survival ratio and condition of the sub-fossil pollen and to assess the potential of the sediment for further analysis at 4cm intervals.

The pollen sub-samples were disaggregated, swirled, and sieved at 140µm and 6µm, following Hunt (1985) and Wheeler (2007). A pollen sum of 500 total land pollen grains (TLP) was used, excluding spores, as this count rate was considered adequate to provide a realistic and quantitative assessment of the local vegetation. Pollen was counted and identified using a Leica Galen III microscope at magnification x400. Equal traverses were made across the width of each microscope slide with all identifiable pollen being counted. The pollen was identified in accordance with the keys in Moore *et al.* (1991), Beug (2004), supported by Reille (1999, 1998, 1991) and a modern pollen type-slide reference collection. Nomenclature follows Stace (2001).

Pollen percentage values were calculated using Microsoft Excel (2003) and transposed using WinTran 1.5 (Juggins 2002) into a Tilia file. The Tilia formatted data was converted in the pollen diagram format using TGView 2.0.2 (Grimm 2004). Data percentage values were calculated against a summed total of raw data. Raw data was calculated as a percentage of the total pollen data i.e. 500 grains. All pollen data are expressed in percentages as this is the most reliable method when sediment cores represent irregular deposition (Berglund & Ralska-Jasiewiczowa 1986). Rare pollen types are quantified at ≤2%. Spores, microscopic charcoal (>5µm), and fungal spores (after van Geel *et al.* 2003) were also identified and counted to provide additional proxy data to establish fire or clearance episodes, erosional phases, and/or animal grazing at the site. These counts were not included in the total pollen sum being counted in addition to TLP and expressed as percentages of 500. The arrangement of axes, taxa, including summary charts, AMS radiocarbon and additional proxy data follow standard conventions (Moore *et al.* 1991). The results of the identification of fungi (after van Geel *et al.* 2003) observed in monolith 1 are presented in Table 4. The stratigraphic sequence of the palaeochannel and sub-samples are presented from the basal sub-sample of monolith 1 (54cm) to the upper sub-sample of monolith 2 (138cm), and are discussed chronologically from the base upwards. Depth measurements to the left of the lithology (Figure 1) are representative of the eleven sub-samples analysed. The macrofossil assemblage is presented in Table 3.

Depth (cm)	Hue of supernatant	Description of macrofossil component
138	Light brown	No macrofossils present
134	Light brown	No macrofossils present/medium-grained white sand
130	Dark grey	Fine root fibres/medium-grained white sand
126	Dark brown	Fine root fibres and fragments of wood/rootwood (≤ 2mm x 1mm)/medium to fine-grained light brown sand
122	Brown	Concentration of fine root fibres/medium-grained white sand
118	Dark brown	Fine root fibres/charcoal particles/fine-grained white sand
114	Dark brown	Fine root fibres/charcoal particles/medium- to fine-grained white sand
110	Dark brown	Charcoal particles/medium-grained white sand and sub-angular quartz mineral grains (≤ 4mm x 2.5mm)
106	Dark brown	Occasional root fibres/concentration of charcoal particles/medium- to fine-grained white sand
102	Dark brown	Occasional root fibres/concentration of charcoal particles/medium- to fine-grained white sand
98 (monolith 1)	Dark brown	Fine root fibres/concentration of charcoal particles/medium- to fine-grained white sand
98 (monolith 2)	Dark brown	Concentration of charcoal particles/medium- to fine-grained white sand
94 (monolith 1)	Dark brown	Fine root fibres/concentration of charcoal particles/medium- to fine-grained white sand
94 (monolith 2)	Dark brown	Fine root fibres/wood/rootwood fragments (≤ 2mm x 1mm)/medium- to fine-grained white sand
90	Dark brown	Fine root fibres/charcoal particles/medium- to fine-grained white sand
86	Dark brown	Charcoal particles/medium- to fine-grained white sand
82	Brown	Fine root fibres and wood/rootwood fragments (≤ 2mm x 1mm)/charcoal particles/fine-grained white sand
78	Dark brown	Wood/rootwood fragments (≤ 1.5mm x 1mm)/bone or shell fragment (≤ 2mm x 1mm)/charcoal particles/medium- to fine-grained white sand
74	Dark grey	Fine root fibres/rootwood fragments (≤ 1.5mm x 1mm)/charcoal particles/medium- to fine-grained white sand
58	Grey	Fine root fibres/rootwood fragments (≤ 1.5mm x 1mm)/medium- to fine-grained light brown sand
54	Grey	Fine root fibres/rootwood fragments (≤ 5mm x 1.5mm)/medium- to fine-grained light brown sand

Table 3. Macrofossils and supernatant hues recorded in all sub-samples processed for analysis from the Pillings Lock Quarry monolith sequence.

3. Interpretation

The pollen diagram (Figure 1) has been divided into two zones - PLQ1 and PLQ2. The upper zone PLQ2 subsumes a short time frame within the early Bronze Age, a chronology provided by the two AMS radiocarbon dates. The underlying zone PLQ1 is more difficult to assess, despite the Mesolithic radiocarbon date at 83-84cm, because of the absence of sufficient quantities of pollen for identification and counting in the sub-samples as a result of poor preservation. Thus the horizon at 90cm has been drawn to define the boundary which corresponds with the subsequent influx of pollen at 94cm and which underlies the earlier of the two Bronze Age dates. The boundary in the sedimentary sequence at 90cm indicates the stratigraphy of the palaeochannel between the two zones is not chronologically continuous, and sediment representative of the Neolithic period has been lost.

PLQ1 (54-90cm)

The absence of sub-fossil pollen in a condition suitable for identification in the four basal sub-samples from this natural site in quantities sufficient for counting is reflective of poor depositional and taphonomic conditions, as opposed to being the result of the laboratory extraction process - which did not use acid digestion or acetolysis. As the quality of pollen grain preservation in sediments is determined to some extent by the conditions under which the sediment accumulates (Moore *et al.* 1999, 168), the poor preservation and the very low (<15 grains) pollen presence observed in each sub-sample from monolith 2 suggests the sediment was subjected to regular disturbance, and/or the pollen had a traumatic depositional and/or post-depositional history. There is of course the possibility that the poor condition and low ratio of pollen grains from monolith 2 may have been exacerbated by oxidation during storage, although the sediment was firm and moist, and well-wrapped at the time of sub-sampling. Corrosion, degradation and, to a lesser degree, mechanical damage were noted as affecting the majority of pollen grains in the four sub-samples fully analysed. As a result of these observations, a cursory examination was conducted of the sub-samples prepared but not selected for analysis at 74cm, 82cm and 90cm. Examination of these additional sub-samples revealed an equally low pollen presence (<15 grains) with similar levels of deterioration as noted in the four fully analysed sub-samples.

As corrosion and degradation may be due to a variety of causes, such as microbial attack, chemical and biochemical oxidation, mechanical forces, high temperature (Delcourt & Delcourt 1980; Havinga 1967), and pH levels >5.5 (Andersen 1991), (although in the latter case Havinga (1967) cites Potter and Rowley's (1960) findings of pollen found in highly alkaline (pH 9) silty surface material in a dried lake basin) the differential destruction of pollen grains recorded for this sample-set appears reflective of a mixture of preservation states and deterioration factors which have occurred during and after deposition. Pollen grains representative of the preservation categories defined by Delcourt and Delcourt (1980) (produced in tabular format in Jones *et al.* (2007)) were observed in all sub-samples from monolith 2. The ratio of non-identifiable pollen grains to identifiable pollen grains was 50:50 at 54cm, 58cm, and 86cm, but all grains at 78cm were indeterminate as a result of severe corrosion. Charcoal particulates were observed in all sub-samples assessed, including 74cm, 82cm, and 90cm. The presence of microscopic charcoal particles, particularly the disproportionately high ratio of particulates in comparison to low pollen counts, whilst indicative of burning, supports the hypothesis that deterioration caused by oxidation may have been exacerbated by local episodes of fire which would have reduced the overall influx of pollen significantly prior to deposition and/or redeposition at the site as these high charcoal : low pollen ratios appear typical of this phenomenon (Havinga 1967). Corroded and degraded grains were quantitatively dominant in all sub-samples followed by mechanically damaged pollen grains (<5%), and finally by pollen grains, but to a much lesser extent, obscured by authigenic mineral detritus on the slides (<1.5%). Bias resulting from the ability of different taxa to resist destruction can only be surmised in this study as identifiable pollen was found in insufficient quantities to offer a cross-species comparison between type and their respective deterioration markers.

Trends noted in the pollen that was identified from the sub-samples fully analysed, even in low quantities (<15 grains), shows Poaceae had the greatest number of grains with evidence of corrosive and/or degraded damage and mechanical stress (50%), whereas *Quercus*, *Betula*, *Corylus*, *Salix*, and Cyperaceae, whilst also demonstrating deterioration as a result of corrosion and degradation, and mechanical damage, showed quantifiably less evidence of damage (25% per taxon). Whilst the greater levels of deterioration in Poaceae could be attributed to internal factors pertinent to the structural properties of the pollen grains, the lower oxidation susceptibility of arboreal and shrub varieties (Campbell 1999; Havinga 1967) is demonstrated as these particular taxon have a greater preservation ratio along with, in this case study and interestingly, Cyperaceae - despite its structural similarity to Poaceae. It is therefore difficult to attribute bias in this dataset to taxa specific deterioration, unless, of course, the assemblage has been subjected to species selective destruction (see Campbell 1999; Goldstein 1960; Havinga 1967; Lowe 1982; Sangster & Dale 1964) which has effected and significantly reduced pollen specific spectra and therefore biased the data-set. One explanation for the greater deterioration ratio for Poaceae would be simply influx superiority. The high levels of corrosion and degradation observed in all sub-samples from PLQ1 can most probably be attributed to periodic aeration, and microbial activity as a result of the presence of organic matter such as root fibres and rootwood (see Table 1 and Table 3), whilst the presence of pollen grains with signs of mechanical damage caused by physical stresses are likely to be caused by waterborne transport, compaction, and post-depositional diagenesis. The predominance of corroded and degraded pollen grains in comparison to fewer pollen grains demonstrating mechanical stress suggests the microfossils were subjected to differential preservation selection pressures and originated from multiple sources. If the lower counts of mechanical deterioration can be attributed to damage during waterborne transit, it is possible that the corroded and/or degraded components of the pollen assemblage reached the final deposit by a variety of routes. Thus the assemblage appears to have been subjected to multiple selective deterioration processes, which raises questions concerning the source, redeposition, and mixing of pollen grains at the site.

The lithology of PLQ1 (see Table 1 and Figure 1) suggests a hypothesis which may explain the poor pollen ratio and high levels of deterioration, as well as the complexities of source and pollen deposition for this zone. Firstly, the stratigraphy implies two distinct phases of deposition between 54-80cm and 80-90cm demonstrated by deposits of sandy clay over gravel (25-30cm), followed by the accumulation of sandy clayey silt. Absence of silt in the former deposit and the presence of sandy clay and sub-angular and rounded gravel imply waterborne transportation, and/or natural solifluction, and/or possibly the relocation of clasts reflective of river action and deflated organic sedimentation during the early Holocene. The overlying dark brown sandy clay silt layer also suggests a high humic content which may also be reflective of deflated organic sedimentation as opposed to flooding and/or erosion. The presence of organic matter in the basal deposits infers a warmer climate than that suggested by the underlying deposits below monolith 2 where organics are absent. The presence of a thin shelly silt at 5-10cm between two bands of gravel (0-5cm and 10-15cm respectively) is suggestive of a Lateglacial and short term freshwater deposit, such as a series of shallow pools linked by a braided channel system within gravel banks. The influx of inorganic red clay (15-20cm) sandwiched between two bands of gravel (10-15cm and 25-30cm respectively) is most probably indicative of flooding during the late periglacial, prior to the onset of seasonal floods and the subsequent deposition of clay sand silts in the early Holocene, a trend which is also seen at Croft (Smith *et al.* 2005), Narborough Bog and Kirby Muxloe (Brown 1999), and in both the Trent (Greenwood & Smith 2005; Howard 2005; Howard & Knight 2004) and Nene valleys (Brown 1999).

Secondly, pollen transportation by flood water would explain the mechanical damage observed in grains from all sub-samples assessed from PLQ1, but as the species component of mechanically damaged pollen grains is not representative of pre-Quaternary vegetation, it is proposed that these grains are indeed characteristic of the early Holocene, specifically second phase vegetation from a relatively local source. High levels of corrosion and degradation affecting the majority of pollen grains, with or without mechanical damage, are most likely to be the result of oxidation probably exacerbated by bacterial and fungal inoculation, which would explain the severe deterioration and the apparent quantitative loss of microfossil evidence from monolith 2. Sediment oxidation, in this context, may be the result of aeration caused by periodic drying following each depositional event, particularly if the palaeochannel was a chute cutoff from, for example, a plugged meander loop forming an oxbow lake.

The negative palynological data-set for PLQ1 whilst providing little evidence of the vegetational diversity at Quorn during the late-glacial or post-glacial periods, does demonstrate the hydrological and taphonomical complexities associated with the assessment of pollen deposition and preservation, along with the sedimentary history of this small natural floodplain site. The sedimentary boundary at 80cm and the inclusions of silt in the overlying deposit (80-90cm), which corresponds with the Mesolithic date, may be reflective of initial colluvial downwash as a result of either natural or anthropogenic episodes of fire. Similarly, the presence of microscopic charcoal in all sub-samples between 74cm and 90cm indicates phases of burning occurred prior to the influx of silt at 80cm. As the radiocarbon date at 83-84cm post-dates *c*. 8650 BP, there is the possibility that these events may be associated with disturbance to the Mesolithic forest ecosystem, which complements regional evidence for a general increase in forest burning and erosion during this period (for a summary of work to date see Myers 2006, 56). It is also possible that the boundary in the lithology at 80cm post-dates the earlier to later Mesolithic transition *c*. 8650 BP, and, from an environmental perspective, represents settlement changes and hunting strategies which included the creation and/or maintenance of clearings through the use of fire (Myers 2006). The presence of detrital sand throughout PLQ1 along with gravel, small pebbles, and sub-angular inclusions of sandstone between 30cm and the horizon at 90cm, suggests the channel may have been cut or re-cut by intermittent fluvial activity, which Smith *et al.* (2005) also noted at Croft, which parallels the incision and re-working of gravels, coarse sands and organic silts thought to be common in the major lowland river systems in the early and late Holocene before the onset of alluviation (Macklin 1999).

PLQ2 (90-138cm)
The stratigraphic boundary at 90cm defines the horizon between PLQ1 and PLQ2. The Mesolithic provenance of the underlying deposit (80-90cm) in PLQ1, and the influx of deciduous and shrub pollen at 94cm, specifically the low *Ulmus* count (5.6%), and also the absence of *Pinus* sp., provides a relative post-elm decline date for this boundary and overlying sediment, which supports the hypothesis that the Neolithic sediment is missing. The provision of two radiocarbon dates at 100-105cm (3740 ± 40 BP) and 129-130cm (3710 ± 40 BP) confirms that PLQ2 (90-138cm) is Early Bronze Age, which, as a result of the short timescale implied by the radiocarbon dates, may be reflective of the local vegetation presence in relation to short-term and wet-dry seasonal fluctuations. The boundary at this point may, as a result of the high influx of microscopic charcoal at 94cm, be reflective of flooding and/or anthropogenic solifluction caused by burning and subsequent deforestation and erosion. The presence of the spore type 207 *Glomus cf. fasciculatum* (a chlamydospore which derives from coprophilous fungi) also at 94cm is particularly interesting as it is indicative of soil erosion (van Geel *et al.* 2003), which, in this context, was most probably triggered by fire.

The appearance of pollen at 94cm reflects the qualitative improvement of microfossils within the sedimentary stratigraphy of the palaeochannel at this point. Greater levels of preservation enabled counting to 500 TLP and the identification and collation of additional proxy data, i.e. spores and fungal spores (after van Geel *et al*. 2003). Despite the overall improvement in both the quantitative and qualitative presence of pollen grains, all seven sub-samples contained a proportion of corroded and degraded pollen. 94cm was the only sub-sample to show slight evidence of mechanically damaged pollen grains, which, due its proximity to the boundary at 90cm, may be representative of fluvial activity in response to high rainfall and/or localised flooding. It is evident that the pollen assemblage for this particular sub-sample originated from dual sources, with the greater ratio of corroded pollen (88%) suggesting a predominantly riparian and airborne source, whilst the lesser quota of fluvially transported pollen (11%) probably represents the relatively low-energy overflow and inwash of the main river channel into, for example, an oxbow lake, or as a result of avulsion, an abandoned channel which may have been occasionally fed by low-velocity overflow.

The pollen spectrum at 94cm is dominated by herbaceous pollen, specifically Cyperaceae (sedges) 36.6% and Poaceae (grasses) 26.4%, with a much lower arboreal presence represented by *Ulmus* 5.6% (elm), *Quercus* 4.6% (oak), *Betula* 3.8% (birch), *Fraxinus* 3% (ash), and *Alnus* 2.4% (alder), whilst *Corylus* 16.8% (hazel) and *Salix* 0.8% (willow) represent the shrub component. The relatively low presence of arboreal species, particularly in relation to the comparatively high presence of *Corylus* and herbaceous taxa, is reflective of local influx most probably from a shrubby area which formed a clearing along the woodland fringe on the river terrace, and/or from flora adjacent to the channel. The low *Ulmus* presence, which is obviously reflective of the post-elm decline environment, along with low counts of *Quercus* and also the absence of *Tilia* (lime), may be representative of a percentage decline due to the local establishment of shrub taxa such as *Corylus* and, to a lesser extent *Alnus* and *Salix,* and the influx of colonising species such as *Betula* and *Fraxinus* following clearance. Low pollen counts for arboreal and shrub taxa at 94cm and (with the exception of the negative spectrum at 102cm) in the overlying sub-samples 110-138cm, are analogous with pollen frequencies dated to the Bronze Age at Croft (Smith *et al*. 2005) and Bole Ings, Nottinghamshire (reproduced in Howard & Knight 2004). Although the *Alnus* frequencies at Quorn are much lower throughout PLQ2, ranging from 1.8% to 3% in comparison to much greater counts at Croft (approximately 60%) and Bole Ings (approximately 70%). It is possible that the absence of alder carr at Quorn may be the result of regular management or deliberate cutting and/or burning to keep the area open (particularly if it was a watering place for large herbivores), and/or is representative of a dry area within the floodplain with fringing trees present. The peak in microscopic charcoal at this point is particularly significant as it appears to be demonstrative of the primary phase of Bronze Age forest clearance and corresponds with the wider regional trend (Brown 2000; Clay 2006; Knight & Howard 2004; Monckton 2006; Smith *et al*. 2005). Interestingly, the relatively high influx of *Corylus* at 94cm would support the theory that the area adjacent to the channel was relatively open and regularly burned. The higher counts of *Corylus* at this point are probably reflective of the taxon's ability to resist fire and self-coppice – which would ensure the provision of stemwood for a variety of utilitarian uses and stocks of hazelnuts for food, as well as providing fodder attractive to large herbivores.

The negative pollen result at 102cm, even the absence of corroded/degraded and mechanically damaged pollen grains, coincides with the lithological truncation at 100cm. Similarly, the macrofossil assemblage at 100-105cm was devoid of seeds, buds, mollusc shells or insect remains, with the only organic matter being fine rootlet fibres, and degraded twig and small rootwood fragments (Martin pers. comm. 2008). Inorganic inclusions of pebbles and sub-angular sandstone fragments in association with the presence of clayey silt (see Table 1), sand and microscopic charcoal particles (see Table 3), suggests a phase when the sediment simply dried out.

The five overlying deposits (110-138cm) are also dominated by the major herbaceous components of Cyperaceae and Poaceae. The former taxon displays a gradual decline from 48.4% at 110cm (where it peaks) to 28.4% at 126cm, before increasing again (32.8% at 134cm and 34.4% at 138cm), whilst Poaceae in response to the decline in Cyperaceae between 110-126cm increases, peaking at 134cm (41.6%). The non-appearance of herbaceous taxa indicative of anthropogenic disturbance at 94cm is interesting simply by its absence, although the negative data does support the hypothesis that the basal spectrum of this zone is representative of the initial clearance phase prior to the influx of species reflective of human disturbance in the overlying deposits.

The appearance of Ranunculaceae 1.2% at 110cm, which could be either *Ranunculus repens* L. (Creeping Buttercup) or *Ranunculus aquatilis* L. (Water-crowfoot), and *Corylus* 8.6% and *Myrica gale* 1.2% (Bog-Myrtle), appear representative of dual but local sources, i.e. riparian taxa preferring the higher and drier ground, and/or bar vegetation capable of withstanding wetter conditions. The arboreal pollen presence of *Quercus* 4.4%, *Betula* 3.2%, *Alnus* 3%, *Ulmus* 2.4%, *Fraxinus* 1.2%, and *Fagus* 0.4% alongside the comparatively high count for *Corylus* 8.6%, suggests, with respect to the *Quercus*, *Ulmus* and *Fagus* presence, that woodland was still proximate to the channel, and that light-loving species (*Betula*, *Alnus*, *Fraxinus*, *Corylus*, and *Myrica gale*) were either colonising the forest fringe or infiltrating a relatively open environment. The high Cyperaceae counts are representative of a wet and boggy area most likely populated by rush along the floodplain on vegetated bars, whilst the presence of Poaceae appears reflective of rough grass or reed, such as *Phragmites,* along the river terrace. Spores, specifically *Dryopteris* 0.8% (Buckler-ferns) and *Polypodium* 0.4% (Polypodies), also indicate a damp site, but one which was not devoid of canopy cover.

At 118cm, the rise in shrub pollen frequencies to 17.4%, specifically *Corylus* to 17%, and the overall fall in arboreal pollen 13.8%, and the disappearance of spores at 118cm, which corresponds with the rise of Poaceae 35.8% and decline of Cyperaceae 31.6%, appears representative of a response to earlier phases of burning indicated by the microscopic charcoal counts at 94cm (118.4%), followed by the less intense episode of burning at 110cm (59.6%). The spectrum also indicates that ground conditions became drier and more open as a result of the reappearance of *Salix* (0.4%) and the disappearance of *Myrica gale*, the decline of Cyperaceae by 16.8% and the influx of Poaceae to 35.8%, and the absence of ferns. Interestingly, the appearance of *Plantago media* L. 0.2% (Hoary Plantain) and Lactucaceae 0.2% (Dandelions) suggests anthropogenic disturbance consistent with, for example, pasture management.

The rise in arboreal pollen at 126cm 21.2% as a result of the influx of *Quercus* 15.4%, in relation to the overall decline of arboreal and shrub species, and the drop in microscopic charcoal (11.6%), is indicative of a phase of regeneration for this taxon. The rise in oak appears to be associated with the simultaneous decline of *Ulmus* and appears reflective of consistently low *Ulmus* values which post-date the major European elm decline (Brown 2000). The failure of *Ulmus* to regenerate or to produce quantities of pollen, in comparison to *Quercus*, may reflect the utilisation of Elm for animal fodder by lopping or shredding the branches when the species is in full leaf. Oak may have been exploited differently to maintain sexual activity to ensure an annual supply of acorns which could be used as a food stock and/or foodstuff, particularly after the initial phases of clearance. There are of course alternative hypotheses which postulate the failure of *Ulmus* to regenerate, for example, the result of fungal disease, the effect of the opening of the canopy which had previously suppressed *Quercus* and no longer provided a suitable environment in which Elm could thrive thus enabling other species to colonise the space, or simply that following clearance *Quercus* found favourable conditions in which it could regenerate out of the forest environment. The reappearance of spores, particularly *Dryopteris* 2%, *Polypodium* 0.4%, and the appearance of *Pteridium* 0.8% (bracken) at 126cm, indicates that the surrounding forest fringe was temporarily re-established to provide a semi-shady environment favourable to ferns. The decline in *Corylus* 9.6% and *Alnus* 0.6%, at the point where *Quercus* peaks, may also be representative of a response to cutting, thus reducing the initial output of pollen for the former taxon but creating a non-competitive environment in which the latter could temporarily thrive, or the result of animal grazing at the time when each plant is sexually active. The rise of Ranunculaceae 5.6% and the appearance of Asteraceae 0.8% (Daisy family), coupled with the relative stability of Cyperaceae and Poaceae, may represent a relatively open area of predominantly rush along the riverbanks with rough grass and reed on the slopes of the river terrace, which appears to have been undisturbed or temporarily abandoned for a short period of time.

The influx of anthropogenic disturbance markers such as Chenopodiaceae 0.2% (Goosefoot family) and the reappearance of Lactucaceae 1%, and the continued presence of Ranunculaceae 2.2% and Asteraceae 0.2% at 134cm is suggestive renewed pasture management. The rise in herbaceous pollen to 78%, particularly the influx of Poaceae 41.6%, along with the decline in arboreal and shrub taxa to 12.6% and 9.4% respectively, suggests that the reduction of pollen output produced by tree and shrub taxa may have been the affect of more mature and thus lower sexual activity and pollen output, or that pollen influx decreased as a result of an increasingly competitive environment, or that shrub and arboreal species were being selectively managed – be it by controlled fire, felling and/or cutting, or a combination of all three. The actual decline of *Quercus* and *Ulmus* by 50%, and the slight decline of *Corylus* (by 0.4%), *Salix* (by 0.4%), and *Betula* (by 1%), is suggestive of a selective management/exploitation strategy which may be representative of cutting practises such as the shredding or pollarding of *Quercus* and *Ulmus* for branchwood and their leaf stocks, and, in the case of *Quercus*, branch lopping to obtain acorns, whilst species such as *Corylus*, *Salix* and *Betula* may have been subjected to coppicing regimes or clear cutting to encourage new and fast growth. There is also the possibility that the riparian vegetation and proximate woodland fringe were simply over-grazed or clear cut, and/or small-scale selective burning was being utilised to clear ground after felling and/or cutting, or to simply raze selected pockets of vegetation.

At 138cm the spectra displays a rise in both arboreal 16.4% and shrub pollen 12.2%, and a slight decline in herbaceous species, specifically Poaceae by 7.4%, which coincides with the rise in microscopic charcoal (31.4%). Influx rises in *Quercus* 9.6%, *Ulmus* 1.4%, *Fraxinus* 2.4%, *Salix* 1.2%, and *Corylus* 11%, appear to be associated with an episode of burning that is comparable with the palaeopollutant levels recorded at 118cm. It is therefore possible that burning was being used cyclically to limit arboreal and shrub regeneration in order to maintain a relatively open environment to encourage large herbivores to the site. Whether this was clear felled and/or cut vegetation, or simply the result of selective burning, can only be speculated in the absence of any corroborative archaeological evidence. Interestingly the dominant presence of *Corylus* throughout PLQ2 is likely to be the result not only of the durability of this particular taxon to withstand fire, but the result of a selective strategy which may have preserved stocks to provide foodstuffs that are attractive to large herbivores in mantle and fringe vegetation (Vera 2000), whilst simultaneously providing materials and food for human utilisation and consumption. The influx of *Polypodium* and *Dryopteris* at this point, despite the decline of *Pteridium*, would also suggest that the vegetation framing the site remained suitably shady and that ground conditions were relatively damp, thus encouraging these species to thrive. Similarly, the slight rise in Cyperaceae to 34.4% and the corresponding decline of Poaceae from 41.6% at 134cm to 34.2% also suggests the site may have been becoming wetter.

Spores derived from fungal spores were observed in all five sub-samples analysed from monolith 1. This additional proxy data-set is presented in Table 4. The presence of chlamydospores indicative of soil erosion complement the data collated as a result of the examination of the sediment and the macrofossil component of the monolith sequence for PLQ2 (see Table 2 and Table 3) and indicate continual soil erosion, most probably as a result of clearance and the maintenance of cleared areas adjacent to the site. Spores of dung-loving fungi were also recorded throughout the sequence (see Table 4), supporting the hypothesis that grazing animals frequented the site. Fluctuating hydrological conditions are also suggested by the presence of *Valsaria variospora*-type at 126cm, which is indicative of wet conditions such as standing water, and may be reflective of variable fluvial velocity and water volume in the channel, which could be attributed to meander migration or the temporary flooding, and/or the formation of a boggy area immediately adjacent to the palaeochannel as ground conditions became wetter, or simply the environment in the channel.

Spore types	**Indicator value (after van Geel *et al.* 2003)**	**Depths (cm) observed**				
		110	**118**	**126**	**134**	**138**
207: *Glomus cf. fasciculatum,* chlamydospores	Indicative of the erosion of soils	✓	✓	✓	✓	✓
140: *Valsaria variospora*-type, ascospores	Formed in eutrophic conditions			✓		
261: *Arnium*-type, ascospores	*Sordaria* type – indicative of the presence of dung	✓	✓	✓	✓	✓

Table 4. Spore types derived from fungal spores observed in sub-samples from monolith 1 (PLQ2)

4. Conclusion

The palynological and complementary proxy analyses conducted on the monolith sequence from Pillings Lock Quarry at Quorn have provided data-sets which have enabled a model to be constructed of the associated hydrological and vegetational history of this natural site in the Soar floodplain. The negative palynological data recorded for PLQ1, whilst disappointing both quantitatively and qualitatively in terms of species composition and variability, provides testimony to poor taphonomic conditions at the site. The causes of such high levels of deterioration and poor preservation observed in the microfossil assemblage for the basal sequence, along with the probability of selective deterioration and multiple source origins, and also the remixing and redeposition of the sediment as a result of fluvial velocity and/or deflated organic sedimentation which may have disturbed and/or truncated the lithology at 80cm. The appearance of microscopic charcoal at 74cm beneath the inwash of silt at 80cm indicates that burning pre-empted alluvial deposition, and at 74-80cm coincides relatively, if the stratigraphy is chronologically continuous, with the earlier to later Mesolithic transition.

The influx of pollen at 94cm-138cm (with the exception of the boundary at 102cm) is reflective of improved taphonomic conditions at the site, most probably wetter conditions resulting from standing water and/or deflated organic sedimentation, which would have prevented or restricted aeration. This hypothesis is supported by the presence of fungal spores which are consistent with fluctuating hydrology, specifically wetter ground conditions such as standing water at 126cm and on-going alluvial deposition 110-138cm (see Table 4). The wetter conditions demonstrated by the proxy data from Quorn correspond with gradual climatic deterioration seen elsewhere in Britain during the Early Bronze Age (Barber *et al.* 1994, Chambers *et al.* 1997, Hughes *et al.* 2000, Knight & Howard 2004, Macklin 1999).

The 'sedimentological window' (Smith *et al.* 2005) provided by the data-set from monolith 1 (PLQ2) suggests a human-environment relationship had developed at the site by the early Bronze Age, following initial clearance during the Neolithic period.

The presence of the dung-specific coprophilous fungal marker *Arnium*-type in sediment subjected to wetter and more stable hydrological conditions generally (110-138cm) is evidence not only of improved diagenesis, but also faunal activity at the site which coincides with the arrival of herbaceous pollen types indicative of managed pasture. Microscopic charcoal, whilst declining relatively throughout PLQ2, does appear to be connected to the stratigraphic boundary at 102cm following its peak at 94cm, which may be representative of large scale fire and clearance followed by a high-energy flood event and subsequent erosion. Lower influxes of charcoal particulates correspond with relatively stable frequencies of arboreal, shrub, and herbaceous pollen (specifically Cyperaceae and Poaceae) throughout the zone, and have been interpreted as being representative of small-scale selective burning to maintain an open environment adjacent to the palaeochannel. The stability and dominance of *Corylus* in this zone has been attributed to its ability to withstand fire and self-coppice, whilst the regeneration of *Quercus* at 126cm which corresponds with the decline in *Ulmus* to a rare type (1.6%) in this diagram, has been ascribed to a number of possible hypotheses - including the utilisation of the latter species for leaf fodder thus limiting pollen output in comparison to the protection of the oak canopy to ensure acorn production, the susceptibility of elm to fungal disease and the subsequent opening of the canopy which provided suitable conditions for Oak to regenerate, and following burning the inability of elm to regenerate in open conditions more favourable to oak, or that the pollen frequencies are simply reflective of short-term seasonal fluctuations at the site. Selective resource management is also implied by the continuously low frequencies of arboreal species such as *Betula*, *Alnus*, and *Fraxinus*, and similarly low influx frequencies of *Salix,* and the disappearance of *Myrica gale* despite the shift to wetter conditions at the site. There is of course the possibility that the vegetation was simply being heavily or over-grazed by large herbivores visiting the site, although the decrease in palaeopollutants between 94-134cm and the corresponding stability in pollen output from arboreal and shrub species, albeit low, along with the continual prevalence of hazel, appears highly indicative of selective and repetitive burning to maintain an open environment immediately adjacent to the water source. The limited range of arboreal and shrub spectra identified during this work reflects the limited species variability observed by Smith *et al*. (2005) at Croft, and similarly supports Brown's (1988) hypothesis that selective clearance and/or repetitive exploitation reduces the variety of taxa present at a site prior to full clearance.

The analysis of the monolith sequence from Quorn has provided valuable insight into the palaeoenvironmental and palaeoclimatic history of the channel which corresponds with regional and national trends. The short 10-year timeframe represented by radiocarbon dated and sequential deposits in PLQ2 (100-130cm) appears, as Smith *et al*. (2005) found at Croft, to be similarly sensitive to and therefore reflective of very local events within, in this context, a tight date range. The data-set presented for Quorn strongly suggests that burning became less extensive and clearance more controlled and selective half way through the Bronze Age sequence corresponding with the influx of the fungal marker consistent with the presence of animal dung (van Geel *et al*. 2003) and herbaceous pollen suggesting contemporary anthropogenic disturbance (pasture management) at the site. This study is important not only because it presents data that expands our knowledge of anthropogenic impacts to floodplain ecology in prehistory, it also demonstrates small-scale and short-term fluctuations which may be indicative of human modifications and vegetational management, and/or very local and seasonal trends within the Soar floodplain during the Early Bronze Age.

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11th April 2008

Appendix 5

Quorn, Leicestershire
Environmental sampling of a palaeochannel

The Environmental Archaeology Consultancy was commissioned by Archaeological Project Services, Heckington, Lincolnshire to undertake the sampling and initial radiocarbon dating of palaeochannel deposits revealed by quarrying immediately north of the village of Quorn and east of the A6.

A palaeochannel was observed in the quarry face and the sequence of deposits in the channel was briefly described (Table 1).

Table 1.

232 cm	topsoil stripped off
190-232	light brown alluvial clay
175-190	sandy gravel
140-175	grey alluvial clay
85-140	very dark grey silt with pebbles and lots root penetration
30-85	light grey brown clay/silt with some stone
25-30	gravel
15-20	red clay
10-15	gravel
5-10	thin shelly silt band
0-5	gravel

Two monolith samples were taken from the deposits at 50-100cm and 92-142cm spanning the grey brown clay/silt and dark grey silt sequence in the channel. Additionally two bulk samples were taken. One from the basal shelly band at 5-10cm and the second from the organic dark grey silts at 100-105cm.

The latter sample was washed and twigs extracted from the coarse residue for radiocarbon dating. The remainder of the sample has been retained for possible future macrofossil analysis.

The twigs from 100-105cm were submitted to Beta Analytic Inc (Miami, Florida) for radiocarbon dating and the following result was received:

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 209081	3770 +/- 40 BP	-27.9 o/oo	3720 +/- 40 BP

SAMPLE : QUORN-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 2210 to 2010 (Cal BP 4160 to 3960)

The dating results indicate that the channel represents an early Bronze Age course of the nearby river and the survival of twigs and other organic debris in the sample that was washed indicates that organic survival in the channels deposits is good. The 92cm sampled sequence of the channel fills was targetted on the most promising deposits and it is anticipated that pollen in good condition will survive throughout the sampled deposits.

These deposits therefore offer an important opportunity to investigate the palaeo-environmental history of the Bronze Age in this part of the Soar valley just east of Charnwood Forest. The time frame of the deposits may be limited and further radiocarbon dates will almost certainly be needed to establish the full chronology of the sampled sediments. In an area where peat bogs or mires of any antiquity are very rare such palaeo-channels often afford the only means by which the vegetational history, and landscape character, of an area can be established and the human impacts upon it. Deposits of similar date from other palaeochannels in the county have been studied at Croft, Kirby Muxloe and Castle Donington (Clay 2001), none of which lies in the Soar valley, and the closest is at Kirby Muxloe, some 8-9 miles as the crow flies to the south west. Monckton (2003) has indicated that the study of more such deposits are needed for us to understand the vegetational history of the region and identify the impact of human activity on the natural environment.

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Appendix. Radiocarbon calibration curve.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.9:lab. mult=1)

Laboratory number: **Beta-209081**

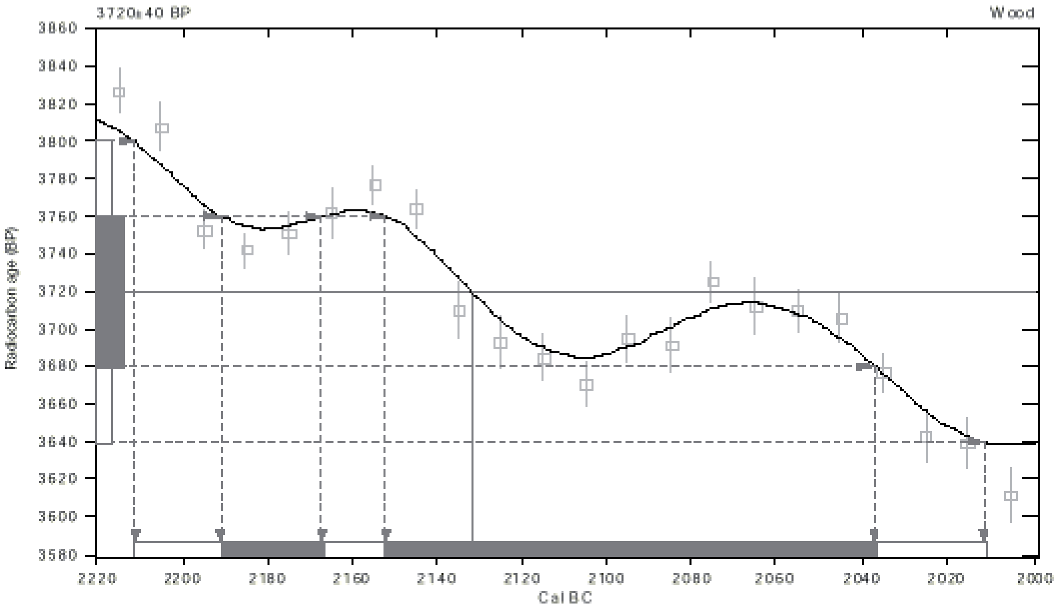
Conventional radiocarbon age: **3720±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 2210 to 2010 (Cal BP 4160 to 3960)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 2130 (Cal BP 4080)

1 Sigma calibrated results: (68% probability) Cal BC 2190 to 2170 (Cal BP 4140 to 4120) and Cal BC 2150 to 2040 (Cal BP 4100 to 3990)



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Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

Quorn, Leicestershire

Radiocarbon dates from the top and bottom of the column sample

Mr. James Rackham | Report Date: 4/10/2007

Environmental Archaeology Consultancy | Material Received: 3/5/2007

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 228376	7810 +/- 50 BP	-26.9 o/oo	7780 +/- 50 BP

SAMPLE : QPL03-83-84cm
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 6690 to 6490 (Cal BP 8640 to 8440)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 228377	3760 +/- 40 BP	-28.2 o/oo	3710 +/- 40 BP

SAMPLE : QPL03-129-130cm
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 2200 to 2010 (Cal BP 4150 to 3960) AND Cal BC 2000 to 1980 (Cal BP 3950 to 3930)

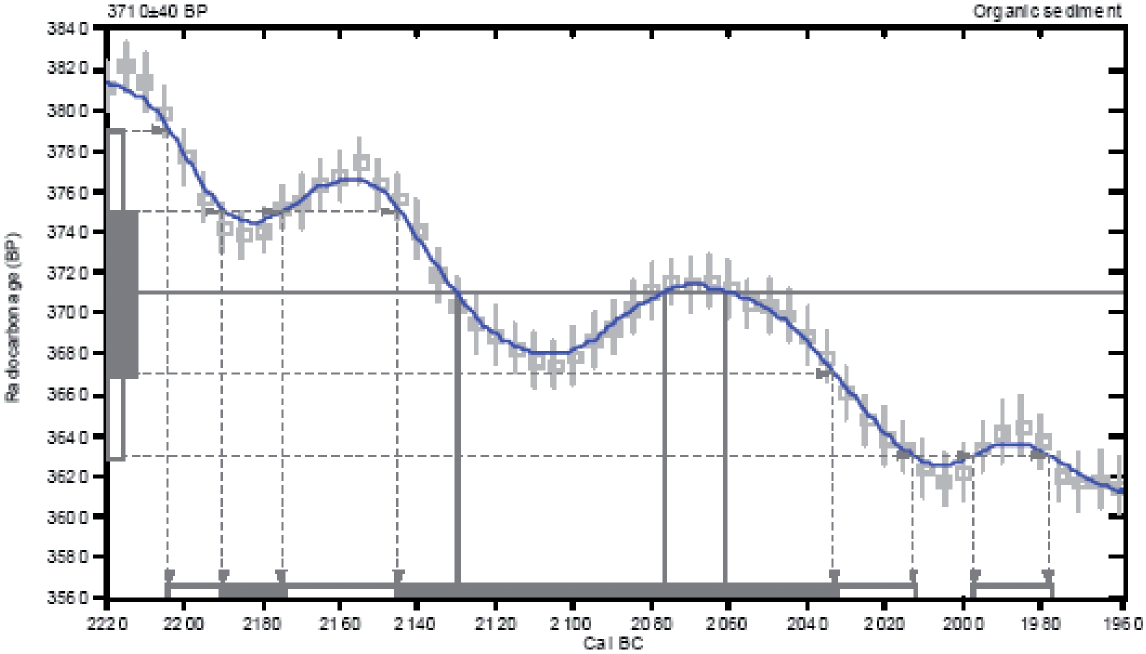
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.2:lab. mult=1)

Laboratory number:	**Beta-228377**
Conventional radiocarbon age:	**3710±40 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 2200 to 2010 (Cal BP 4150 to 3960) and Cal BC 2000 to 1980 (Cal BP 3950 to 3930)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 2130 (Cal BP 4080) and Cal BC 2080 (Cal BP 4030) and Cal BC 2060 (Cal BP 4010)
1 Sigma calibrated results: (68% probability)	Cal BC 2190 to 2180 (Cal BP 4140 to 4120) and Cal BC 2140 to 2030 (Cal BP 4100 to 3980)



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Database used
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.9:lab. mult=1)

Laboratory number: **Beta-228376**

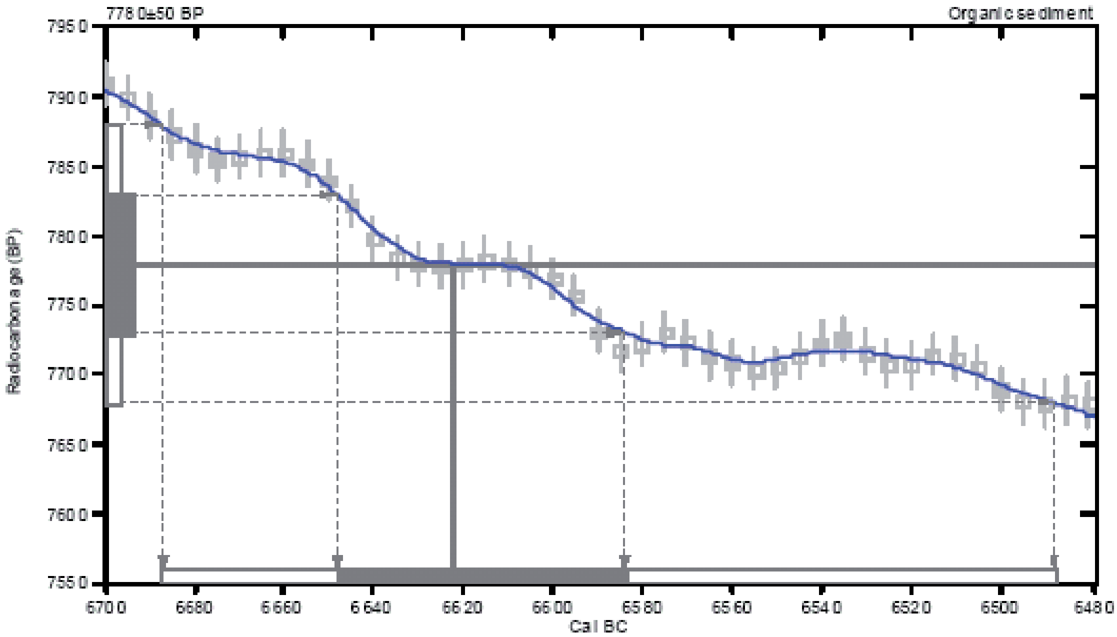
Conventional radiocarbon age: **7780±50 BP**

2 Sigma calibrated result: **Cal BC 6690 to 6490 (Cal BP 8640 to 8440)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 6620 (Cal BP 8570)

1 Sigma calibrated result: Cal BC 6650 to 6580 (Cal BP 8600 to 8530)
(68% probability)



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Database used
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Appendix 6

GLOSSARY

Alluvium	Deposits laid down by water. Marine alluvium is deposited by the sea, and fresh water alluvium is laid down by rivers and in lakes.
Anglo-Saxon	Pertaining to the period when Britain was occupied by peoples from northern Germany, Denmark and adjacent areas. The period dates from approximately AD 450-1066.
Bronze Age	A period characterised by the introduction of bronze into the country for tools, between 2250 and 800 BC.
Context	An archaeological context represents a distinct archaeological event or process. For example, the action of digging a pit creates a context (the cut) as does the process of its subsequent backfill (the fill). Each context encountered during an archaeological investigation is allocated a unique number by the archaeologist and a record sheet detailing the description and interpretation of the context (the context sheet) is created and placed in the site archive. Context numbers are identified within the report text by brackets, e.g. [004].
Cropmark	A mark that is produced by the effect of underlying archaeological or geological features influencing the growth of a particular crop.
Cut	A cut refers to the physical action of digging a posthole, pit, ditch, foundation trench, etc. Once the fills of these features are removed during an archaeological investigation the original 'cut' is therefore exposed and subsequently recorded.
Domesday Survey	A survey of property ownership in England compiled on the instruction of William I for taxation purposes in 1086 AD.
Fill	Once a feature has been dug it begins to silt up (either slowly or rapidly) or it can be back-filled manually. The soil(s) that become contained by the 'cut' are referred to as its fill(s).
Geophysical Survey	Essentially non-invasive methods of examining below the ground surface by measuring deviations in the physical properties and characteristics of the earth. Techniques include magnetometry and resistivity survey.
Iron Age	A period characterised by the introduction of Iron into the country for tools, between 800 BC and AD 50.
Layer	A layer is a term used to describe an accumulation of soil or other material that is not contained within a cut.
Medieval	The Middle Ages, dating from approximately AD 1066-1500.
Mesolithic	The ‘Middle Stone Age’ period, part of the prehistoric era, dating from approximately 11000 - 4500 BC.
Manuring Scatter	A distribution of artefacts, usually pottery, created by the spreading of manure and domestic refuse from settlements onto arable fields. Such scatters can provide an indication of the extent and period of arable agriculture in the landscape.
Natural	Undisturbed deposit(s) of soil or rock which have accumulated without the influence of human activity

Neolithic	The 'New Stone Age' period, part of the prehistoric era, dating from approximately 4500 - 2250 BC.
Palaeolithic	The 'Old Stone Age' period, part of the prehistoric era, dating from approximately 500000 - 11000 BC in Britain.
Post hole	The hole cut to take a timber post, usually in an upright position. The hole may have been dug larger than the post and contain soil or stones to support the post. Alternatively, the posthole may have been formed through the process of driving the post into the ground.
Post-medieval	The period following the Middle Ages, dating from approximately AD 1500-1800.
Prehistoric	The period of human history prior to the introduction of writing. In Britain the prehistoric period lasts from the first evidence of human occupation about 500,000 BC, until the Roman invasion in the middle of the 1st century AD.
Ridge and Furrow	The remains of arable cultivation consisting of raised rounded strips separated by furrows. It is characteristic of open field agriculture.
Romano-British	Pertaining to the period dating from AD 43-410 when the Romans occupied Britain.
Saxon	Pertaining to the period dating from AD 410-1066 when England was largely settled by tribes from northern Germany
Transformed	Soil deposits that have been changed. The agencies of such changes include natural processes, such as fluctuating water tables, worm or root action, and human activities such as gardening or agriculture. This transformation process serves to homogenise soil, erasing evidence of layering or features.

Appendix 7

THE ARCHIVE

The archive consists of:

25	-	Context records
3	-	Photographic record sheets
5	-	Drawing sheets
3	-	bags of finds

All primary records and finds are currently kept at:

Archaeological Project Services
The Old School
Cameron Street
Heckington
Sleaford
Lincolnshire
NG34 9RW

The ultimate destination of the project archive is:

Leicestershire County Council Heritage Services
Room 500
County Hall
Leicester Road
Glenfield
Leicester
LE3 8TE

Accession Number:	X.A116.2003
Archaeological Project Services Site Code:	QPL03

The discussion and comments provided in this report are based on the archaeology revealed during the site investigations. Other archaeological finds and features may exist on the development site but away from the areas exposed during the course of this fieldwork. *Archaeological Project Services* cannot confirm that those areas unexposed are free from archaeology nor that any archaeology present there is of a similar character to that revealed during the current investigation.